

*The*  
**AUDIO-VISUAL  
HANDBOOK**

ELLSTON C. DENT

~~TENAFLY HIGH SCHOOL~~

CURRICULUM OFFICE  
TENAFLY PUBLIC SCHOOLS

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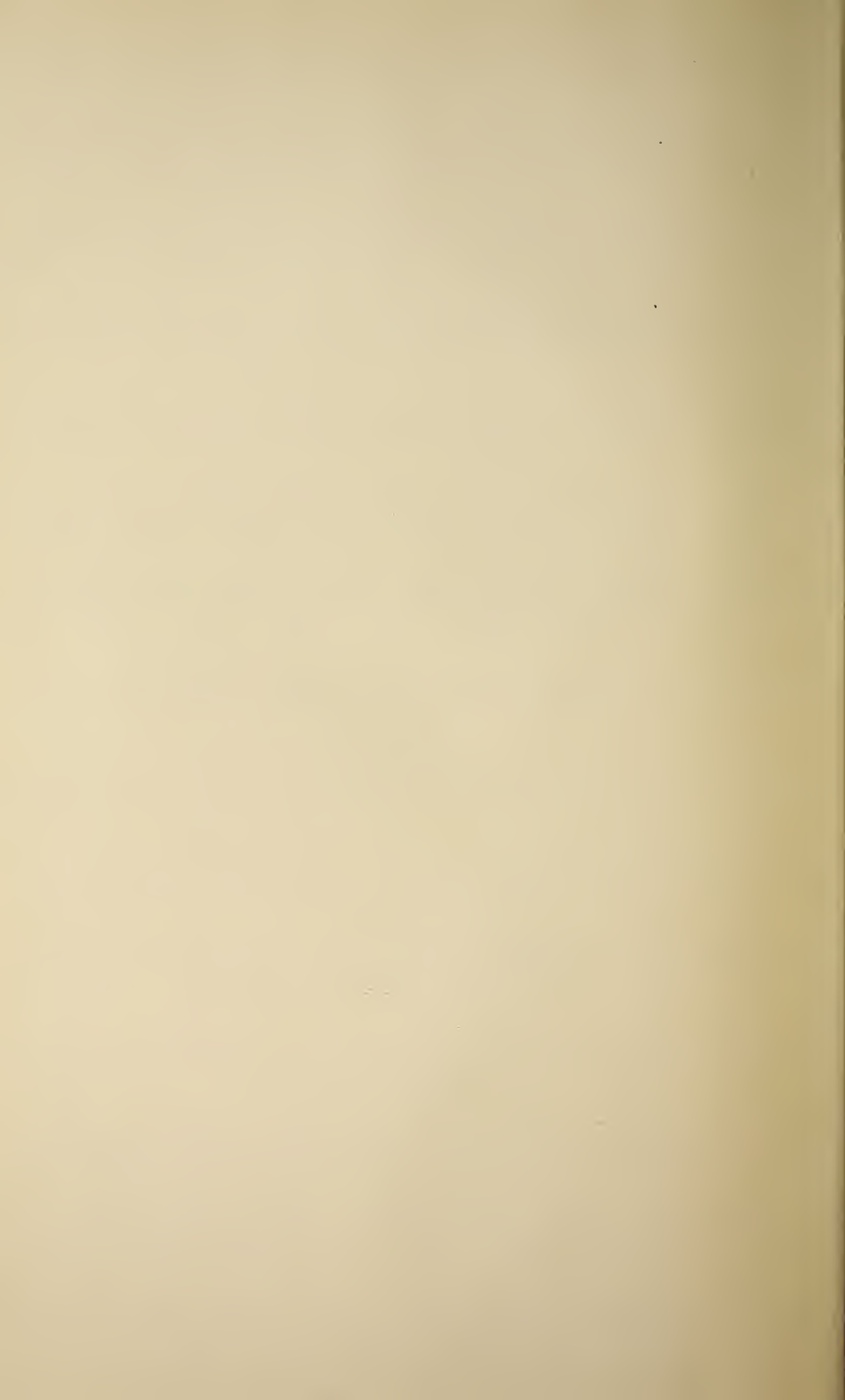
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THE  
AUDIO-VISUAL HANDBOOK



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# AUDIO-VISUAL HANDBOOK

BY

**ELLSWORTH C. DENT**

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## **ACKNOWLEDGMENT**

The information and suggestions contained in this HANDBOOK have been accumulated from many sources. The author hereby acknowledges with appreciation the numerous comments which have been submitted by those who use the HANDBOOK for classroom and reference purposes.

Special acknowledgment and thanks are extended to Dr. I. Keith Tyler for the source list concerning radio in education.

## Author's Note

THE major purpose of this book is indicated by its title—a handbook of information in convenient arrangement for those who should be interested in using audio-visual aids to instruction. It is intended primarily for those in either of two general classifications: (1) educators in service who desire brief general information concerning audio-visual aids to learning, as well as a guide to sources of materials and further information; and (2) students in teacher-training institutions, whose desires should include the same.

This book is limited in size for one principal reason: to provide a service manual at moderate cost. It would have been easier to have included more material, rather than choose that which seems to be of greatest general value. There are numerous other sources mentioned from which more detailed information may be secured.

The first edition of this HANDBOOK was published in 1934. It was then planned that there should be frequent revisions to keep pace with the many new developments in the audio-visual field. Accordingly, this, the fourth edition, contains much information concerning new materials and equipment and their sources. There will be future revisions as required to provide an up-to-date source of information.

The need for such a source book was evidenced earlier by the unusually large number of inquiries from school people requesting this type of information. It has been evidenced since by the steadily increasing demand for this and other publications in the audio-visual field. Fortunately for school people, both the quantity and quality of such publications have increased appreciably during the past few years.

It is not pretended that this publication includes even a major portion of the detailed information required to explore the audio-visual field thoroughly. Instead, it provides an outline which might well be used as the base for such exploration as may be possible within the time limitations of audio-visual courses or individual research.

E. C. D.



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*Photo Courtesy U. S. Department of the Interior*

**VERNAL FALLS, YOSEMITE NATIONAL PARK**

# I

## The Status of Audio-Visual Instruction

### *The Meaning of "Visual Instruction"*

THE somewhat frequent misinterpretation of the term, visual instruction, seems to warrant brief consideration of its common meaning. In the evolutionary process of adapting illustrative materials to classroom and other instruction, "visual" instruction seems to be in the second stage. The original designation, "visual education," has been discarded by many inasmuch as it seems to designate a special field in education, rather than a set of materials and simple rules for their effective use, co-ordinated with all educative activity.

In the early stages of the development of the use of visual aids, it was thought that the eye was all-powerful in the educative process. Some were enthusiastic enough to state that 80 to 85 per cent of all we know is learned through the eye. Others surmised that it would not be long until texts would be replaced by pictorial substitutes for the printed word. Later, it was found that some of these speculations were a bit extravagant, if not absurd, and that the other senses are very important in receiving a clear impression of the material to be learned. It was found that the sense of touch aided materially in giving correct concepts of objects, specimens, models. The sense of smell became important in many situations. In other cases, taste came to the rescue. And the sometimes unadorned ear has been recognized as highly important to learning.

A more sane analysis of the true factors affecting learning has developed another term—"visual-sensory aids"—which seems to be in favor among the leaders in this field. The term is applied to all materials used in the classroom, or in other teaching situations, to facilitate the understanding of the written or spoken word. The most important is the visual, but it is interlinked with the other senses in such a way that it would be difficult to separate one from the other or to determine the exact separate contribution of each. In fact, there are few psychologists who would attempt so to control all other factors that the true learning power of each of the senses might be segregated and measured. Perhaps, after all, there is no good reason for becoming unduly concerned over the matter.



It may be sufficient to state that the eye is considered to be primary in importance, thus giving us the right to place it ahead of the other senses. In this situation the term, "visual-sensory aids," becomes a more nearly true statement of the situation than would "visual education" or "visual instruction." The development of sound pictures; sound filmstrips; radio programs; sound recording, reproducing and distributing equipment—all of which are being used extensively among schools—have brought into general use a comparatively new term, "audio-visual." It is used to encompass almost the entire field of illustrative materials; visual aids, sound aids, and the various combinations of the two. Perhaps all might be classified more appropriately under the general term, "scientific aids to learning," as very few can do more than aid the pupil in his acquisition of usable knowledge.

The discussion which follows will consider the different types of visual aids, with some suggestions concerning the use of such aids. Following, in turn, there will be discussions of sound aids and of audio-visual aids to instruction. The next several pages will be concerned almost entirely with visual aids.

### *Pictures in Education*

The use of the picture as an aid in education is not new in any sense of the word. For many thousands of years it has been exceedingly important in conveying correct impressions from one to another. Perhaps it was the first substitute for pantomime, or the re-enacting of the event, which became more and more difficult with the increase in the complexity of the social structure and of knowledge. Perhaps its first use was as a warning, carved on the bark of a tree or scratched on the surface of a stone, to tell others of dangers in that vicinity. Regardless of its earliest use, we are reasonably certain that a picture language was the forerunner of our modern alphabet.

As the printed letter or word has become further removed from its ancestor, the picture, it has become more and more abstract; more and more difficult for the human mind to understand fully. A technical discussion of almost any subject before an average group is understood only by those who have had training in that field. The same discussion, presented in the usual language of most of us, might become clear and understandable, particularly if a few pertinent illustrative materials were used. We recognize symbols and think only in terms of past experience. Accordingly, it is imperative that we include in our educational procedure the maximum number of

those things or representations of things which aid in clarifying thought—in making objective the abstract.

One factor which has served to retard the normal development of the use of visual-sensory aids to instruction has been the narrow interpretation of some of the most active workers. Some have thought of visual instruction as being the use of motion pictures for instructional purposes; others have thought of the glass slide or film-slide; and still others have thought only of the excursion or of museum materials. There are those who have argued that the talking or sound motion picture is the acme of perfection in visual instruction. Some have had the feeling that the silent motion picture is more valuable in many situations. Some have considered that the glass slide offered more educational advantages than any other type of projected picture. Some have not given the film-slide fair consideration, because of its size, while others have found it to be extremely valuable in many situations.

These extreme claims for one type and criticisms of other forms of audio-visual aids have done much to place the novice in a quandary, wondering if there is any true value in any of the materials mentioned. This is an unfortunate situation, and might be eliminated by giving each type fair and careful consideration. The school journey is one of the most effective of all teaching tools, if applied properly. Similarly, the exhibit, the photograph, the stereograph, the glass slide, the film-slide, the 2" x 2" slide, the silent motion picture, and the sound motion picture will produce extremely satisfactory results if applied when, where, and as they should be applied. Each has its place and there is a place for each in nearly every teaching situation. In certain situations, some will be found to be better than others. Combinations of types are frequently desirable.

Another factor which has tended to retard the more extensive use of visual-sensory aids to instruction has been the overstatement of facts relative to certain findings. If one is in the market for an automobile and an enthusiastic salesman represents his type of car as being twice as speedy; capable of giving twice as much mileage on a gallon of gasoline; twice the mileage on tires; and twice the mileage without repairs or adjustments, as compared with other cars of similar type and price, it is quite probable his veracity would be questioned. The same feeling has developed relative to certain statements issued by those who have become super-enthusiastic about the instructional possibilities of certain visual-sensory aids.

The late noted scientist, who predicted more than twenty years ago that we should be able, soon, to throw away our texts, discharge the

majority of our teachers, and teach the children in two or three hours each day with carefully selected motion pictures, did not live to see this change take place. He did see the motion picture become one of the most valuable aids to the teacher and to the text, but found both the teacher and the text to be even more necessary than before. On the other hand, his prediction may have caused useless worry on the part of teachers, and perhaps some antagonism toward this revolutionary tool which they thought might replace them in the classrooms. If there are teachers, still, who are disturbed by fears that these valuable teaching aids will replace them, such fears should be discharged immediately. The appropriate use of visual-sensory aids to learning will increase pupil interest, participation, and independent action, thus increasing the importance and functions of the teacher.

Very few, if any, of the commonly used visual-sensory aids are instructional in themselves. If used with groups which have not received earlier preparation and guidance by the teacher, much of the possible educative power will be lost. On the other hand, these same materials, properly used by trained teachers, make it possible to teach the child more in a given time, and teach him more thoroughly, so he will remember the information or instruction much longer. The advantage gained by this procedure, easily measured, has been found to range from a small percentage to 40 per cent or more, depending largely upon the favorable and unfavorable factors involved. The percentage gain, in carefully controlled classroom situations, has been great enough and consistent enough to cause most educators to look with favor upon the proper application of visual-sensory aids to instruction.

This discussion which follows does not intentionally recommend one type of visual-sensory aid over another, except in certain specific situations where one would seem to be more effective than another. The majority of the statements are made on the premise that each of the many different types of aids will have certain values, if properly applied; that some types are better for some situations; and that selections should be made in accordance with the problems at hand. The chief purpose of the book is to serve as a guide to those who desire assistance in selecting and securing visual-sensory aids which will contribute to the teaching of this or that specific subject or lesson.

### *The General Use of Audio-Visual Aids*

It is hardly necessary to go outside the realm of daily experience to bring to mind the importance of the visual representation in form-



ing lasting impressions. We remember that which has been unusual and which has been seen clearly. The magazine, book, or newspaper which does not use pertinent and abundant illustrations is limited in circulation. Industry has found the motion picture, the slide, the photograph, and the chart to be highly successful in the training of men; in showing manufacturing processes; and in encouraging the public to purchase. The motion picture, alone, has been accused of affecting our daily life with a force exceeded only by the combined influence of the press and the radio.

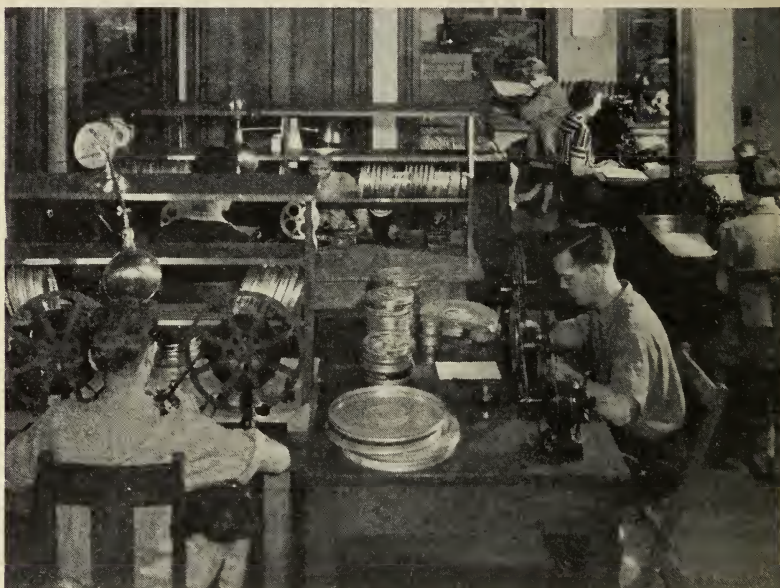
In the educational field, experimental evidence has favored the use of visual-sensory aids in practically every carefully controlled experiment. This has caused the thinking educator to give consideration to educational possibilities. Schools have organized audio-visual divisions for the purpose of co-ordination and centralization of effort. States have formed audio-visual departments or bureaus for the purpose of providing films, slides, recordings, and the like on loan to those schools which cannot afford to purchase the necessary materials. Nations have organized research departments and production facilities for the purposes of directing audio-visual activities and providing the necessary useful materials.

It is interesting to note that the great majority of the leading cities of the United States have well-organized and functioning audio-visual departments. A very small part of the list includes such familiar names as Birmingham, Phoenix, Berkeley, Long Beach, Los Angeles, San Diego, San Francisco, Pueblo, Hartford, Bridgeport, Washington, D. C., Atlanta, Bloomington, Gary, Indianapolis, Sioux City, Atchison, Winfield, Cambridge, Detroit, Kalamazoo, Hibbing, Red Wing, Kansas City, St. Louis, Montclair, Newark, Trenton, Albany, Ithaca, New York City, Schenectady, Winston-Salem, Chicago, Cleveland, Toledo, Tulsa, Portland, Erie, Pittsburgh, Philadelphia, Reading, Scranton, Providence, San Antonio, Richmond, Seattle, and many others, in all parts of the United States.

Many of the smaller city, county, and district school systems have delegated the work of the audio-visual department to one or more persons on the regular staff. There are several thousands of such part-time visual instruction workers scattered throughout the country.

Among the states and territories which have a loan service of visual-sensory aids to education are Alabama, Arizona, California, Colorado, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Hampshire, New York, North Carolina, North Dakota,

Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Texas, Utah, Virginia, Washington, and Wisconsin. The majority of these service bureaus have been in operation for several years. Other states have started this type of service or plan to do so soon.

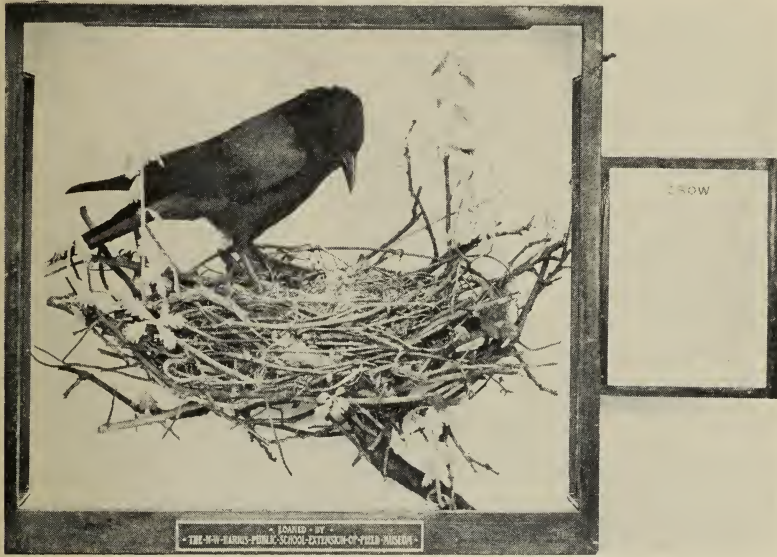


*Photo Courtesy Visual Instruction Department, University of Wisconsin*

#### **A Visual Instruction Department**

Augmenting this service we find numerous national and local museums ready to lend materials to schools. Notable among these are the American Museum of Natural History and the Metropolitan Museum of Art, New York; The Children's Museum, Hartford, Connecticut; Field Museum, Chicago; Buffalo Society of Natural Sciences; Cleveland Educational Museum; Pennsylvania State Museum; Carnegie Museum; The Commercial Museum, Philadelphia; The Cambridge Museum for Children; St. Paul Institute; the Children's Museum of Detroit; Kent Scientific Museum, Grand Rapids, Michigan; Brooklyn Children's Museum; Huntington Museum and Art Gallery; University of Pennsylvania Museum; Erie Public Museum; St. Louis Educational Museum; and the Milwaukee Public Museum.

The United States Departments of Agriculture, Commerce, Interior and Labor; Bureau of Commercial Economics; Pan-American Union; National Museum; and other old and new Federal and related organizations in Washington, D. C., offer loan and advisory service to schools and to other educational organizations. Many of these service bureaus have materials available for loan without charge, except for transpor-



*Photo Courtesy Field Museum of Natural History*

#### **Exhibit from a Museum Loan**

tation. In the case of the Division of Motion Pictures, Department of the Interior, one or two reels of 16 mm. motion pictures, silent or sound, will be sent under Government frank, thus eliminating postage one way. The Office of Education is giving special attention to the application of visual-sensory aids to instruction.

The various defense activities include greater use of audio-visual aids to learning than at any other time in our nation's history. Films produced and under production are designed for instruction in many phases of production; and the motion-picture camera is being used regularly for job analysis and work simplification. Sound filmstrips teach cooks, and maps provide the solution to many tactical problems. First aid, the operation of field equipment, the building of pontoon



bridges—all are taught with carefully prepared films, demonstrations, and other illustrative materials. The lecture method of earlier years has been found to be both inadequate and inefficient.

The American Council on Education provides a clearinghouse of research and information for all who may be interested in problems relating to the audio-visual field, especially those relating to the use of motion pictures. The Committee on Scientific Aids to Learning is studying the effectiveness of sound filmstrips and recordings. The Association of School Film Libraries is co-ordinating distribution of educational motion pictures, and the Motion Picture Producers and Distributors of America have made many subjects for classroom use through Teaching Film Custodians, Inc. In general, all types of audio-visual aids are receiving more intelligent consideration than at any time in the past, and there is every indication of a continued and accelerated increase in the attention given to these effective teaching aids.

The developments in the United States find parallels in other countries. The Canadian Government Motion Picture Bureau produces educational, industrial, and scenic motion pictures and slides for distribution throughout the Dominion. The British Museum offers its facilities to the schools of England. China is using the poster and projected picture extensively to guide group thinking.

Similar application of visual-sensory aids to instruction is found in all parts of the world. Some cities in Europe have their own production studios and distribution service. The Australian Government Motion Picture Bureau has been in operation for several years. Various organizations in New Zealand, India, China, Japan, South Africa, Australia, Brazil, Argentina, Chile, and Mexico are giving active attention to the production and use of motion pictures and other audio-visual aids.

A brief glance at the activities in various localities indicates that the leading school systems of the United States are making regular use of visual-sensory aids to education. The majority of the states have organized service bureaus to care for the needs of the schools which cannot well afford to purchase materials. Many state and private educational institutions are offering training courses in the use of audio-visual materials to enrich instruction. In Pennsylvania, this training is required for certification. Other states are giving consideration to similar requirements. In some of the city teachers' colleges, visual instruction courses are required of those who plan to teach in the fields of social, general, natural, and physical sciences. Many museums are offering training courses for teachers in service.

Similar extension courses are being offered by university, college, and other teacher preparation institutions throughout the United States.

The proper use of audio-visual aids is receiving more and more attention from the educational leaders and leading educational organizations. Many of the state teachers' associations have audio-visual or visual instruction sections which meet concurrently with other sections of the associations. Many of the history, science, and geography sections of state and local teachers' associations include demonstrations of audio-visual materials and equipment on their programs. Several of the leading national educational magazines and some official publications of state teachers' associations are devoting space to the problems and practice of audio-visual instruction. These tend to encourage intelligent consideration of materials which have been found to be effective in teaching.

### *The Use of Audio-Visual Aids in Industry*

The majority of the more common visual aids now in regular use among schools were first applied to the training problems of industry. Industrial groups, in many instances, were composed of curious mixtures of American and foreign-born workers. Many could not understand the printed word, especially if in English. It became necessary, therefore, to devise ways and means of teaching safety, cleanliness, co-operation, and the intricacies of the individual duties. Pictures were found to be of great value, inasmuch as all could understand the pictured message.

Exhibits, slides, charts, posters, silent and sound filmstrips, and motion pictures have become important tools in the inner and outer relationships of the more prominent industries. The General Electric Company, for example, has a very complete assortment of glass slides, filmstrips, and motion pictures of practically all phases of the electrical industry, as well as the application of electrical devices to other industrial fields. These are used for technical instruction, sales promotion, public relations, and very extensively for instructional use in educational groups of all kinds—in and out of school.

The Ford Motor Company uses motion pictures of the national parks and other scenic areas to encourage travel, and has produced many films for general educational use. General Motors, Chrysler, RCA, and literally dozens of other large and small industries use motion pictures, filmstrips, and exhibits for sales training and general promotion.

The Bureau of Mines, United States Department of the Interior, has a large group of motion pictures of the mineral industries, which are

available for use anywhere in the United States at no cost except for transportation. The Extension Service of the United States Department of Agriculture has a very complete library of visual aids covering practically all phases of the agricultural industry. In addition to



*Photo Courtesy The Jam Handy Organization*

### **An Industrial Class**

motion pictures on many subjects, there are slides, posters, exhibits, pamphlets, and books with carefully selected illustrations. The United States Forest Service has many more panels, exhibits, slides, and films available for loan to educational groups or for sale to those who desire to use the material regularly through the school year.

Industries use motion pictures, slides, filmstrips, charts, and exhibits for both direct and indirect advertising. There are exhibits of silkworms and silk; sugar in the various stages of refining; salt and salt mining methods; spices from all parts of the world; the manufacture of linen, cotton, and woolen goods; paints and pigments; the manufacture of pens and pencils; and of pottery making. There are charts showing the different meat cuts; products of the various sections of the United States; how to prepare certain foods properly; balanced diets for children of all ages; the arrangement of a model farm; and many other interesting subjects.

Slides and filmslides are available to show the complete details of manufacturing processes; history and development of an industry; and such other information as might be of interest to the groups requesting service. Motion pictures cover all phases of the majority of the leading industries of the United States. Many of these fine films contain little or no direct advertising material, but attempt to give a true picture of the inner workings of the industry.

### *The Use of Audio-Visual Aids Among Schools*

The 1936 survey\* of 8806 schools and school systems, conducted by the Office of Education and the American Council of Education, contains some interesting information concerning the use of visual and other aids among schools. It is rather evident from the reports of manufacturers that the survey does not cover all the schools using visual aids. On the other hand, it is valuable to note that the 8806 schools and school systems reporting have 7671 instruments for the projection of pictures in the school. In addition, it was reported that these same schools owned 11,501 radio receiving sets, nearly a thousand centralized sound systems, approximately three-quarters of a million phonograph records, and more than three million glass slides.

These figures, in order to be meaningful, require a much more complete analysis of the survey than it is possible to present here. Any survey is limited by the co-operation and accuracy of those who provide the information. Accordingly, the most important information derived from the survey is that which relates to the use of these various aids among those schools which did report.

As an example, the graph on page 12 summarizes the extent to which all types of audio-visual aids are used among a certain group of junior high schools which reported. It will be noted that this summary includes only junior high schools with enrollments of 750 to 2499, and that reports from approximately 2000 such schools were received.

The most significant information one might gain from the junior high school graph is a rather clear impression of the extent to which different types of audio-visual aids are actually used in the classrooms. The amount of white space on each bar is very small, except for the bars indicating reported use of stereographs and filmslides. These two aids, low in cost and small in size, are less likely to be reported ac-

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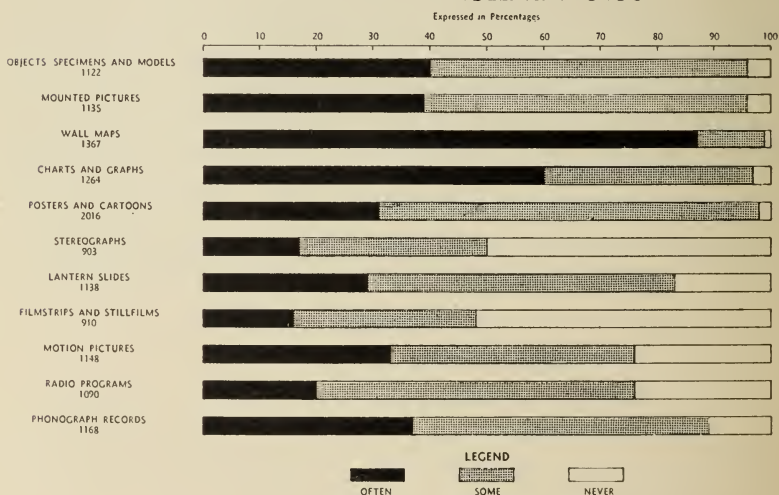
\*Koon, Cline M., and Noble, Allan W., "National Visual Education Directory," 1936. Published by American Council on Education, Washington, D. C.



curately, and are used more extensively in the elementary grades. Accordingly, it is doubtful if either is represented fairly in the accompanying graph. As might be expected, the nonmechanical aids are used more extensively than those which require machines for projection or reproduction.\* It is interesting to note, further, that phonograph records are used more regularly among the schools reporting than any of the other aids requiring special equipment for their use.

A close study of the survey and related information makes it rather safe to conclude that the majority of the schools, public and private, in the United States are making regular use of some type or types of

**EXTENT OF USE of ALL AUDIO-VISUAL AIDS  
in JUNIOR HIGH SCHOOLS of  
750 - 2499 ENROLLMENT GROUP**



*Graph Courtesy Office of Education (1936 Survey)*

audio-visual aids to education. Some are using abnormal quantities of certain types and subnormal quantities of other types. On the other hand, many are employing a truly balanced program, applying school journeys, museum materials, photographs, slides, filmstrips, motion pictures, phonograph records, and other visual, audio-visual, and sound

\*Compare graphs on subsequent pages as follows: Mounted Pictures, p. 48; Motion Pictures, p. 123; Phonograph Records, p. 133; Radio Programs, p. 141.



aids when and as they are needed.

It should be mentioned here that, although the 1936 survey was the most complete at the time, many more schools have begun the systematic use of audio-visual aids during the past few years than during any similar period in the past. Thousands of filmstrip projectors, motion-picture projectors, radio receiving sets, phonographs, and school sound systems have been purchased by schools. Also it is reported that schools have purchased thousands of filmstrips, motion pictures, lantern slides, and phonograph records, which would change the general picture considerably from what it was in 1936.

### *Survey by U. S. Department of Commerce*

At the request of the nontheatrical motion-picture industry, the Bureau of Foreign and Domestic Commerce is making a survey of facilities for showing educational and industrial motion pictures among all schools in the individual states and territories of the United States. This survey is being conducted in co-operation with the U. S. Office of Education and the American Council on Education. The cost of the survey was underwritten by fifteen of the leading film distributors and manufacturers of projection equipment.

Part I of the completed survey, "Motion-Picture Equipment in Colleges and High Schools," was published in January, 1941, and is being distributed by the Educational Department, RCA Manufacturing Company, Inc., Camden, New Jersey. The survey data, reported in Part I, include those high schools and colleges which own, can borrow, or can rent motion-picture projectors for 16 mm. or 35 mm. film, silent or sound. In addition, similar data are included concerning silent and sound slide film projectors. These data are summarized in the introduction to the published report of the high school and college portion of the survey\* as follows:

"The present survey covers 12,443 16 mm. motion-picture projectors and 2447 35 mm. motion-picture projectors which were reported as owned by colleges and high schools in the United States and its possessions. Of the 12,443 16 mm. projectors, 6059 are silent and 6384 are equipped for sound. Of the 2447 35 mm. projectors, 1624 are silent and 823 are sound.

"Of the total number of projectors in the United States and its

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\*"Survey of Motion-Picture Equipment in Colleges and High Schools in the United States and Its Possessions," 1941. Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

possessions reported in the replies to our questionnaires, 12,411 16 mm. projectors and 2426 35 mm. projectors are in colleges and high schools located in continental United States. Of the 12,411 16 mm. projectors, 6037 are silent and 6374 are sound. The 2426 35 mm. projectors consist of 1612 silent and 814 sound machines.

"The present survey shows that 4182 silent 35 mm. filmstrip projectors and 143 35 mm. sound filmstrip projectors are in use in the colleges and high schools of continental United States and 22 silent and 6 sound projectors in its territories and possessions.

"According to the data presented, 9690 high schools and colleges failed to reply to the questionnaire. It is reasonable to assume that many of these have motion-picture projectors. It may be reasonable to estimate that from 15 to 20 per cent of these failing to reply have at least one 16 mm. projector."

Similar data have been secured from a high percentage of the elementary schools of the United States and its possessions and are now being tabulated. It is expected that the completed report covering the elementary schools will be available early in 1942.

It should be remembered that no such survey can be more complete than the replies received from those who have been asked to supply data. Furthermore, the necessary interval between the collection of data and their tabulation into a printed report also reduces its completeness. Manufacturers of motion picture and slide film equipment have indicated that more projectors have been sold to schools during the past six months than in any similar period in the past. During the same period, there has been a marked increase in the sale of projection equipment to industrial users of motion pictures and slide films. Many of these equipments are also available for occasional use in schools.

The movement, therefore, has long passed the initial stages. It has become a potent factor throughout the educational world. A brief review of early experimental evidence may serve to establish some of the substantial reasons for the rising prominence of the educational tools generally classified under the term "visual-sensory aids to instruction."







The extent to which these valuable aids are used and the degree of effectiveness with which they will be employed in any teaching situation will depend almost entirely upon the amount and quality of the training the teacher has received. The greatest factor retarding the more extensive and more intelligent use of visual-sensory aids is the inadequate training of teachers to make use of the materials available.

The graph on pages 16 and 17 presents a picture of audio-visual developments during the past fifty years. It should be kept in mind that the approximate dates indicated refer to the introduction of these various teaching aids among schools. In most instances these now valuable scientific aids to learning were used several years in industry or for entertainment before they were applied to classroom teaching. This has been true of the glass slide (magic lantern), stereograph, phonograph record, motion picture, film slide, disc recorder, and sound amplifying and distributing equipment. Sound film slides and recordings of radio programs (transcriptions) are just beginning their effective use among schools, although they have been used several years in industry. On the other hand, the very recent developments in television and facsimile are now being used experimentally among schools. Thus the lag between scientific developments and their use for teaching purposes is decreasing and indicates greater alertness among those who guide the education of youth.

The varying widths of bars of the accompanying graph are intended to indicate (1) the approximate extent to which these teaching aids were or are being used among schools, and (2) the approximate variation in their use from year to year. No attempt has been made to indicate minor variations due to the first World War or during the periods of economic adjustment which followed. Those would have been difficult to estimate with any great degree of accuracy and would add little to the over-all picture.

It is significant that so many of the most effective teaching aids now used extensively among schools have been introduced so recently. It is of still greater significance that, of all the different types now in use, only one has decreased in importance as a teaching aid—the 35 mm. silent motion picture. This is entirely logical—its position was first contested by the less expensive and more convenient 16 mm. silent motion picture. Later, when the addition of sound revolutionized the film industry, there was little excuse for continuing to produce or use 35 mm. silent films. The principal use of 35 mm. silent films today is by those who have older projection equipment in usable condition and who have a supply of films available at low cost.

One of the newest developments, the 2" x 2" slide, is now making rapid strides as a teaching aid. The majority of these slides are produced by placing 1" x 1½" film prints or transparencies between 2" x 2" cover glasses, or in cardboard binders, to hold the film in a fixed position for projection and to protect it from dust and damage. Others are produced by printing on emulsion-coated glass—as the

1940	School Journeys	Plays & Pageants	Objects Specimens Models	Maps & Globes	Photos & Prints	Glass Slides	Stereo-graphs	Phono-graph Records	35 mm. Silent Films	Film Slides	Radio Programs
1935											
1930											
1925											
1920											
1915											
1910											
1905											
1900											
1895											
1890											





larger ( $3\frac{1}{4}$ " x 4") glass slides are produced. Still others are produced by drawing or tracing on glass, film, or other transparent materials, very much as pupil-made glass slides of larger size are prepared.



*Photo Courtesy Society for  
Visual Education, Inc.*

#### **Mounted 2" x 2" Slide**

organized stereo-slide service available at present, but it is likely such a library of materials will be made available soon.

The very latest development of the 2" x 2" slide, which offers unusual early future promise, is stereoscopic projection, using one scene photographed from two slightly different angles. The superimposed projection of the two slides is viewed through Polaroid lenses, giving the very real impression of depth or third dimension, either black and white or in natural color. The potential applications of this new development in industry, science, surgery, and classroom teaching are far too great to estimate. There is no

#### ***What Experience Has Taught Us About Visual Aids\****

1. The use of visual instruction may be traced back through the educational history of the race. In primitive times, boys were taught to hunt and fish and girls to cook through imitation, observation, and participation, plus the necessary spoken explanation. Early records were picture records. Cave men drew pictures to warn and inform. The Greeks utilized the school journey, the sand as a blackboard, and real objects or things in their instructional processes. Fore-runners of modern education used visual instruction. Such famous pioneers as Comenius, Rousseau, and Pestalozzi emphasized it.

2. Whereas schools of the past used visual materials, modern science and inventions have opened vast new possibilities in the development of concrete materials for teaching purposes.

(A) The invention of the photograph and of photo-engraving have made possible the illustration of magazines, newspapers, books,

\*McClusky, F. D., et al., "The Place of Visual Instruction in the Modern School," 1932. (Syllabus of a proposed text.)

and school texts on a scale heretofore unimagined.

- (B) The microscope and telescope have revealed the existence of worlds that were unknown a short time ago.
- (C) Stereographs and stereoscopes have brought the illusion of three dimensions to the classroom.
- (D) The motion picture, with and without sound, has become a major factor in modern life for the dissemination of information, knowledge, and ideas.

3. The introduction of visual materials into the modern school on a broad scale has enabled teachers to learn something of their use and value through experience. Some of the more general notions which have been developed as a result of actual experience are:

- (A) That visual aids are most effective when closely correlated with the course of study or curriculum.
- (B) That visual materials will not supplant the textbook, or teacher, but will supplement and increase the effectiveness of the teacher and text. Hence the term "visual aids."
- (C) That the most effective visual lesson is one that is treated as any good lesson should be handled. The mere exposure of children to visual materials will not, by some mysterious process, teach them. Teachers must prepare for the visual lesson in advance.
  - a. Organized units of visual materials are desirable.
  - b. Teachers should be familiar with visual aids before presenting them.
  - c. Pupils must be held responsible for material presented.
- (D) That the organization and administration of visual materials must be such that they are available at the precise moment when the teacher wants them.
- (E) That the inherent nature of visual aids—their concreteness—is such that they should be excellent in quality and accurate in detail. Misinformation obtained through a visual aid is inexcusable.
- (F) That a few pertinent illustrations are better than a score or more of less related ones. For example, the intensive study of a few excellent slides and stereographs is, in most instances, better than a succession of unrelated pictures.
- (G) Visual aids should make accessible in the classroom that which is inaccessible. Visual aids are valuable also in re-creating in the classroom familiar subject matter.
- (H) No one type or class of visual aids should be used to the exclusion of others. Each has its own value and use.

4. Actual experience in the use of visual aids has taught us much

about the various types of visual aids and their own values.

- (A) The stereograph has been found to be valuable as an individual study experience.
- (B) The stereopticon slide or film slide forms an excellent basis for the socialized recitation.
- (C) The motion picture is an effective summarization device.
- (D) The chart and diagram are effective in presenting abstractions and in assisting analysis.

### *Experimental Evidence*

There have been many minor and numerous major experiments in the field of visual instruction during the past twenty years. The majority of these have been reviewed in various issues of the *Educational Screen* and some have been published in book form. The list of investigators includes, among others, the names of those of high reputation in the field of educational research, such as Frank N. Freeman, C. J. Judd, Ben D. Wood, F. D. McClusky, V. C. Arnspiger, George D. Stoddard, Daniel C. Knowlton, J. Warren Tilton, P. J. Rulon, J. J. Weber, Edgar Dale, William Lewin, Charles F. Hoban, Jr., and W. W. Charters.

Dr. Frank N. Freeman, in summarizing the results of a series of experiments conducted by himself and twelve others in eight cities and three universities, states that there is " . . . no support to a belief that pictures may be substituted for language. It does indicate, however, that they have a definite function to perform. This function is determined by the nature and purpose of the instruction. The purpose of instruction at one time is to lay the foundation for thought, reflection, generalization, application. This foundation consists in direct experience with material objects . . . The evidence is that pictures are an invaluable means of getting certain kinds of experience of a concrete sort."

Knowlton and Tilton conducted an experiment with the use of the "Chronicles of America Photoplays" in Troup Junior High School, New Haven, Connecticut.\* Ten of the photoplays were used with the experimental group and the results obtained were contrasted with those secured with regular class instruction. Among the more significant results were the following:

1. The ten photoplays made a large contribution to the teaching of an enriched course of study, increasing the pupils' learning by

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\*Knowlton, Daniel C., and Tilton, J. Warren, "Motion Pictures in History Teaching," Yale University Press, 1929.



about 19 per cent.

2. This contribution was of such magnitude that average children with the aid of the photoplays learned as much as bright children did without them.

3. The photoplays were most effective in teaching a knowledge of inter-relationships involving the interaction of events and of forces. They increased the pupils' learning of this sort 35 per cent, or about twice as much as they increased the gaining of all kinds of historic knowledge.

4. The next largest contribution was to the teaching of historical personages. The increase of learning of this sort attributable to the photoplays was 23 per cent.

5. The contribution to the teaching of historical geography was 19 per cent.

6. In the part of the experiment in which there was no review between teaching and retest for retention, the contribution to retention was greater than, or at least equal to, the contribution to learning. This was the contribution of four photoplays to the teaching of the Revolution. The pupils learned 25 per cent more by the use of the photoplays and remembered 27 per cent more after three months.

7. The contribution to the retention of knowledge of historical relationships other than those of time was greater than the contribution to gaining this knowledge. Of such relationships, pupils learned 35 per cent more, and remembered 43 per cent more.

8. The effect of the photoplays upon pupil participation in classroom discussion was in detail as follows:

- (a) more recitations were made at the request of the teacher;
- (b) a larger percentage of the class recited;
- (c) those reciting did so more often;
- (d) on these occasions more hands were raised;
- (e) more remarks were volunteered by the pupils not directly as a result of a teacher's question, i.e., upon those occasions when their own desire to participate more evidently prompted them;
- (f) a larger percentage of the group so volunteered;
- (g) those volunteering did so more often;
- (h) on these occasions more hands were raised for permission to participate;
- (i) more questions were asked;
- (j) a larger percentage of the group asked questions;
- (k) those who asked questions did so more often;
- (l) fewer contributions came in as a result of outside interest;

- (m) a larger percentage of the group made such contributions;
- (n) those contributing did so less often.

9. The increase in the total number of pupil participations attributable to the use of the photoplays was 10 per cent. This increase is equivalent to forty-six more participations in a year by each pupil, or about 1600 more in a thirty-five-pupil section.

10. Seeing the photoplays caused the pupils to read voluntarily more supplementary history material under controlled classroom conditions;

- (a) 40 per cent more reading was done;
- (b) a larger percentage of the group chose to read;
- (c) the average amount for those reading was larger.

The Eastman experiment, conducted by Wood and Freeman, stands as one of the most comprehensive to date. The experiment was conducted during the spring months of 1928 in twelve large city school systems in which nearly 11,000 children participated. The topics studied were in the fields of geography and general science. The outcome of the teaching was measured by three tests. In both geography and general science, the film-instructed groups were greatly superior to the non-film groups. The following statement was made in a summary of the experiment:

"If we examine the average gains made by the entire group of children in all cities and on all topics taken together, we find that the film group excelled the non-film group by 33 per cent of the standard deviation of all the scores. In the topics on general science, the gains of the film group exceeded those of the non-film group by 15 per cent of the standard deviation . . . These are substantial and reliable differences. The detailed evidence that the differences are reliable is presented in the body of the report."

The above refers to only a few of the many experiments which have been conducted in the field of visual instruction. Other experiments will be mentioned as they may relate to the consideration of certain forms of visual aids. It is interesting to note that, almost without exception, the many experiments to determine the difference between the visual and nonvisual method of teaching have indicated a very favorable advantage for the application of visual-sensory aids to instruction.

### ***The Development of Audio-Visual Aids***

It has been reported by unimpeachable authority that when Thomas A. Edison began his experiments to produce pictures of articles in motion and reproduce those pictures, he had in mind pictures which would illustrate recorded music. The results were not entirely satis-

factory, and early motion pictures were thought by him to have no great commercial or educational possibilities. A group of small but enterprising merchants and peep-show operators had a different idea, which later developed into the great motion picture industry of today.

But pictures and sound were developed separately until the appearance of synchronized sound motion pictures, about fifteen years ago. The reunion was reasonably satisfactory and was developed into the fine sound motion picture of today. Following in a year or two, sound pictures for educational use were developed. Some believed the sound film would soon replace the silent among schools, as it has among theaters. This has not occurred, but there has been unmistakable progress in both production and utilization of motion pictures—silent and sound. There is a tendency toward the greater use of sound films, except in those situations where sound does not contribute to the instructional value of the picture.

Sound picture enthusiasts have stated that silent educational films are as old fashioned and ineffective as silent films for entertainment. Silent picture enthusiasts have maintained that the sound picture tends to interfere with the participation of the classroom teacher; is not as effective as the silent film in presenting many subjects; is more complicated to use; and is more expensive for both films and equipment.

There are many others, increasing in number, who believe that both sound and silent motion pictures have a definite place in the instructional program. They believe that some motion-picture lessons should be presented on silent films, supplemented by pupil or teacher explanation while being projected. They believe that in many instances the teacher who is familiar with the background, training, and objectives of her class can fit the film into that situation better than can some lecturer who does not have this information. On the other hand, they believe that certain scientific or technical films can be explained more effectively and more accurately by leading scientists and technicians. They believe also that illustrative or related sound is necessary to convey the full meaning intended for the pupil in the classroom. These persons are securing equipment which will accommodate both sound and silent films, and are using both.

These same school administrators, supervisors, and teachers are making use of other sound and silent aids wherever they may seem to add to the effectiveness of instruction. They are using phonograph records, radio programs, school radio-sound systems, sound re-enforcing equipment and recording equipment, with greater frequency and

increased effectiveness from month to month. They are using exhibits, charts, photographs, stereographs, glass slides, 2" x 2" slides, and filmstrips where these aids seem to be most effective or most readily available. In place of quibbling over the relative merits of silent and sound films, they are making use of the best of each, while hoping for greater development and use of each, and providing the real reason for the combination of the two older terms "visual aids" and "sound aids" into one shorter and more adequate term, "audio-visual aids to learning."

## II

### Types of Visual Aids and Their Uses

#### *Classroom Experiments and Blackboard Demonstrations*

**T**HESE aids in instruction are familiar to nearly all teachers. The classroom experiment, conducted by the students or by the teacher, offers many opportunities for satisfying the creative urges and instincts of the pupils. The pupils should be relied upon as much as possible for this type of classroom procedure. Science and agriculture texts include instructions for the germination of seeds, growing of insects, preparing an aquarium or a terrarium. Biology, physics, and chemistry texts outline an abundance of experiments which may be conducted by the students. Some of these experiments are too tedious for instructional economy and should be eliminated. Other experiments are pertinent and effective.

One teacher in a junior high school develops much interest in silk, its production and importance, through the culture of the silkworm in the classroom. Eggs are secured, an appropriate case is placed in the corner of the room, and the pupils in that room are able to watch, from day to day, the gradual change from one life form to another. A few skeins of silk and silk samples serve to complete the story in a manner many times as effective as the most interesting story in a text.

There are a few simple rules which should be observed in connection with the use of all visual aids to instruction, particularly classroom experiments and blackboard demonstrations. They should be directly related to or a part of the information and instruction to be imparted to the pupils at the time. They should be accurate and purposeful, well planned in advance, and executed with care. Most of all, any demonstration material in the classroom should be clearly visible to all in that room. Frequently, effective instructional procedure has been wasted because some members of the class could not see the experiment or demonstration clearly.



**An Aquarium Tadpole**



### *The School Journey*

The school journey or field trip, as it is often called, is a school exercise designed to provide sensory experience relative to such phenomena as cannot be brought into the schoolroom. It involves the conducting of pupils to places where the subject matter of instruction—scenes, objects, situations, relationships, etc.—may be studied to the greatest advantage.

1. The school journey contributes meaningful instruction to practically every subject\*.

- (a) The objectives of art are the more readily realized through visits to churches, galleries, scenic spots, landscapes, beautiful architecture, model buildings and homes, artistic windows where clothing, home furnishings, etc., are displayed.
- (b) Geographical relationships are better understood when children are brought into direct touch with life situations, climate, occupations, means of transportation, communication, etc.
- (c) Literature is enriched and the desire to read stimulated through literary rambles—visits to homes of authors, to their resting places, to the spots that inspired their writings. The school journey furnishes a valuable medium in this scheme.

2. Advantages of the school journey.

- (a) The school journey is a co-operative enterprise. Teacher and children join in the project with the child the active agent and the teacher the counselor and guide.
- (b) Shows phenomena in their natural settings.
- (c) Puts children in direct touch, under learning situations, with things, persons, movements, relationships, environments, occupations, trends, functionings.
- (d) Shows three dimensions, natural color, qualities, motion, etc.
- (e) Offers opportunities for socializing instruction and blending school activities with community life.
- (f) Supplies concrete, realistic, meaningful elements.
- (g) Connects directly objects of knowledge with their respective symbols.

3. Limitations of the school journey.

- (a) Requires a great deal of careful organization. Weather conditions and transportation problems sometimes combine to defeat the purpose of the journey.

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\*Hoban, C. F., "The School Journey," Educational Monographs, Department of Public Instruction, Harrisburg, Pennsylvania.

(b) Much time may be wasted getting to and from the objective.

4. Technique recommended for organizing and conducting a school journey:



*Photo Courtesy American Museum of Natural History*

### **School Journey Pupils in the Nature Room of a Museum**

First Step—Evaluate the advantages in taking the particular school journey under consideration in order that as many contacts as possible may be utilized profitably.

Second Step—Determine the purpose for which the journey is to be conducted; or a possible combination of purposes.

Third Step—Examine survey data for:

- (a) Materials that will develop correct concepts.
- (b) Situations around which activities may be organized that will assist pupils in developing desirable attitudes, skills, and habits.

Fourth Step—Make necessary arrangements with:

- (a) School authorities.
- (b) Owners or representatives of places to be visited.

Fifth Step—Initiating the journey.

- (a) Develop the need for making the journey during class discussion or group activity.
- (b) Have pupils fix definitely the aim or purpose of the journey.
- (c) Teacher preparation involves familiarity with place, route, features, and necessary reference material.
- (d) Pupil preparation includes: Equipment—notebook, field glasses, proper clothing, etc.

Sixth Step—Instruction en route and the lesson.

- (a) On the way—pupils alert, cultivating keen observation, at times noting and listing things seen; teacher should be a counselor and guide.
- (b) At the place—the definite lesson; pupils utilizing initiative, self-activity, observation; teacher guiding the organization of pupil observations.
- (c) The return—pupils exchanging ideas, freely discussing experiences, asking questions, etc. Reports from pupils. Discussion of reports; questions by pupils and teacher; evaluating reports. Co-ordinating the work.

Seventh Step—appraising the lesson as to:

- (a) Teaching values; enriching and vitalizing; motivating; socializing.
- (b) Constructive influence on pupils' appreciations, attitudes, habits, skills.

5. The location of the school will determine the nature of the trips and excursions which may be taken.

- (a) School journeys possible in rural communities:

Wild flowers.

The work of running water.

Insects.

Earth features and earth forces.

Birds.

Vegetable and animal life.

The action of frost.

Country industries.

- (b) School journeys possible in cities:

Manufacturing industries.

Commerce.

Physiological features observable in parks and in the community. Human phases of geography—races; nationalities; customs; costumes; various trades and shops; transportation; commerce; evidence of civic organization.

### *Plays and Pageants*

Dramatization of leading works in literature, historical events, and

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the like, has been and is one of the very effective methods of arousing interest, teaching and developing proper appreciation. Pageants have entertained and instructed young and old for many centuries. They may be developed to present almost any historical or geographical situation. Pupils become intensely interested in participation.

The limitation of instructional time makes it necessary to give careful consideration to the proper time and place to develop pageantry or dramatic presentation. The event or situation portrayed should be of enough importance to more than warrant the great amount of time and energy required in preparation. Incidentally, the greatest good



*Photo Courtesy Salt Lake City Chamber of Commerce*

#### Pageantry—Scene from Utah History

will come to those pupils who have a part in the enterprise, so provision should be made for as many as possible to participate.

Another limitation of the pageant is that it is quite likely to require weeks or months of preparation; an hour or more for presentation; and then be forgotten. The last is the most serious. One farsighted school superintendent eliminated the temporary nature of a pageant depicting the history of his state by having the entire performance photographed with a motion-picture camera. The preparation of the pageant had cost thousands of dollars in time and money. Within a period of two hours, it had passed and would have been lost except for the vagueness of memory. But the expenditure of approximately a hundred and fifty dollars for cameraman and film, titles, etc., gave the school a permanent record of the pageant, which could be projected as often as might seem desirable for teaching purposes.

Furthermore, the classes which were studying the history of their state were asked to prepare titles for the film. This required much reading and delving into historical records. Groups of pupils went

to the historical museum of the state for information and assistance. Other pupils went to the libraries for stories of the early history of that section. Still others went to the homes of the oldest settlers of the community for information and for stories of the early days. The various records, readings, and stories were then compared to determine the probable true course of events. Incidentally, these pupils found that several of the scenes in the pageant had been incorrect in their interpretation of events, even though all information had been checked carefully in preparation.

But the greatest value was not that of securing an accurate pictorial record of the history of that section. Instead, the greatest value was to the students in the history classes of that city's schools. The teachers in charge of the history classes were positive in their statements that the students learned more state history in the period of six weeks required to edit the film than the same group of students would have learned throughout the school year under the usual teaching procedure.

### *Objects, Specimens, Models*

The best explanation and suggestions concerning the use of objects, specimens, or models are found in Dr. Hoban's monograph, on "Visual Education and the School Journey."\* They are generally considered to be of great value in educational procedure.

"The object is the thing itself—plant, fruit, vegetable, bird, animal, etc.—that can be brought into the classroom for study. The specimen is a sample, a part intended to show quality, one of several things which represents all—for example, a piece of coal, wood, cloth, etc. The model is a small-size representation, as for example a building, engine, heart, lungs, globe, etc.

"The best place to study cotton would be at a cotton plantation. But . . . children cannot go to a cotton field. The cotton plant, however, with its flower and fruitage, can be brought to the school-room where the children, in addition to seeing its arrangement in the boll, can handle the cotton, feel the fibers, pick out the seeds, go through the process of combing it and twisting it into strands. This exercise, supplemented with photographic material—showing the cotton field, method of planting, stages of growth and cultivation, and the process through which the cotton passes from the boll to the manufactured garment—will enable the child to understand the relationship between cotton as a plant and as an article of clothing.

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\*Hoban, C. F., "Visual Education and the School Journey," Department of Public Instruction, Harrisburg, Pennsylvania, 1930.

“Pages are required to set forth the principles of an engine or motor. The miniature model, amplified with pictorial material, gives a correct representation of the thing and enables the pupils to see the relationship of its various parts. We too often take a considerable period of time to describe verbally or through the printed page a relationship which could be portrayed more accurately and vividly in half or a quarter of the time by means of the natural setting, environment, situation, object, specimen, model, or picture. Only actual tests of the use of these aids are needed to convince the teachers of their value.”

### *The School Museum*

One of the primary requirements of the successful use of visual-sensory aids is that the materials shall be available for use at the time they are needed in the classroom. For this purpose, the school museum becomes almost a necessity in every school system or school unit. Many are inclined to think of a museum as a place where unusual specimens are stored behind glass doors, to be viewed occasionally and to gather dust and other signs of age. On the contrary, the school museum can and should become the most useful service unit in any school.

The requirements for a school museum are simple. Some space is needed, and the space should be easily accessible to all teachers. A part time or student clerk is needed to check materials as they go out and as they return. Aside from these requirements, ordinarily available in any school, there should be an interest in more effective teaching. In most instances, the pupils will do, with enthusiasm, the major part of the work required in collecting and preparing specimens.

The school museum should provide space for the object-specimen-model collection of the school, except possibly those items which are peculiarly adapted to the use of the teacher in one section or room. It should provide space, also, for posters, picture collections, industrial exhibits, special exhibits, glass slides, filmstrips, and such motion pictures as may be owned by the school. In addition, the school museum service might be called upon to handle the circulation of projection equipment, screens, phonographs and phonograph records, reference books and the like. In many instances the school library staff will be able to take care of the school museum service.

There are many sources from which desirable exhibit materials may be secured, at little or no cost. Industrial organizations of

almost every type are ready and anxious to co-operate with those schools which desire to teach the story of various products and commodities. Salt mining organizations provide exhibits of salt in the



*Photo Courtesy Hunter College Elementary School, New York City*

### Picture Study

various stages of manufacture, with illustrations of mining and refining methods; sugar refineries furnish charts of the processes involved in converting the juices of cane and beets to sugar; flour and cereal manufacturers distribute among schools booklets, charts, exhibits, and other materials dealing with the manufacture and use of their products. The same is true of almost any industry of importance—cotton, wool, forest products, mineral industries, fruit, fishing, silk, artificial silk, and many others.

A brief list of some of the sources from which suitable exhibit materials and other classroom aids may be obtained will be found on page 209 of this publication. When writing to these firms for materials or information, it would be well to do so on the official stationery of



the school and advisable for one of the teachers or the principal to write the letter. The majority of the exhibits will be furnished to the schools at little or no charge. The industrial organizations are anxious to have these exhibits placed in the hands of those who will make intelligent use of the materials, but are not interested in providing playthings for the pupils in classes.

All museum materials available in the school—including every type of visual aid—should be cataloged and classified carefully. A copy of the classified list should be given to each teacher, so the teacher may know which of the materials listed pertains to his or her field. A simple mimeographed list would be inexpensive and satisfactory.

The school museum can be adapted to almost any situation. It can be of any size—housing the materials for a single-room rural school, or for an entire city system as in Cleveland, Buffalo, St. Louis, and other cities. It could contain any number of specimens, from one to one hundred thousand, or more. And it should become a definite part of every school unit or system.

Those who may be interested in preparing special exhibits for effective instruction concerning local or general matters will find many helpful concrete suggestions in the book, *The A B C of Exhibit Planning*, by Evart G. Routzahn.\* Dr. Routzahn has published smaller pamphlets on exhibit and chart making, which are available at low cost.

### **Graphs**

Graphs are extremely important in presenting many kinds of information in a way that may be understood readily and clearly. It is hardly necessary to devote any great amount of space in this book to the technique of preparing graphs of various kinds.\*\* The chief requirement of graphic representation of all kinds is unquestioned accuracy. Instructions for making accurate graphs of all usual kinds can be found in any text on elementary statistics. Students in the upper grades are able to construct very satisfactory graphs and should be given elementary training in graph making at an early age. Statistical tables are hard to read, tiresome, and often unintelligible to the reader, young or old. In nearly every instance, the same information can be presented graphically, which will broaden the appeal and should meet the usual requirements for accuracy.

Mrs. Dorris\*\*\* lists the following general rules to be observed in

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\*Routzahn, Evart G., and Mary Swain, *The A B C of Exhibit Planning*, The Russell Sage Foundation, New York, 1919.

\*\*Some simple graphs appear on pages 12, 48, 123, 133, and 141.

\*\*\*Dorris, Anna V., *Visual Instruction in the Public Schools*, Ginn & Co., 1928.

teaching children how to make graphs:

1. Use a good metal-edged ruler and sharp pencil with hard lead. Ink the lines later.
2. Use smooth hard-surfaced paper that is capable of taking both ink and water color easily.
3. Be sure that all data are accurate and up to date before actual construction of the graph is started.
4. Leaving ample space to the left, construct a series of bars starting at a zero line.
5. Space the bars evenly, not too close or too far apart.
6. Encourage the use of guide lines placed at regular intervals. These greatly aid in mentally measuring the comparative length of the black or colored bars.
7. Do not print on the bars. All printing should be at the left of the zero line or horizontal-bar graphs and at the bottom of the zero line in a vertical-bar chart.
8. Numbers denoting the scale used should appear at the top of the series of guide lines.
9. If pictures are used with bar graphs to attract the attention, it is best to place them at the left of the printing so they will not interfere with the reading of the graph.

Similar instructions are included for the making of circle graphs, curve graphs, and picture graphs, changing the technique in accordance with the type of graphic representation used.

### *Maps and Globes*

Maps may be of almost any type, subject, form, color, or dimension. Usually they are found to be extremely valuable in teaching the various phases of geography and history. There are relief maps, physical maps, political maps, and miscellaneous maps. Each has a definite and helpful purpose, if properly constructed and applied. All maps should be strictly up to date in presenting the subject matter and should be corrected as frequently as may be necessary. The presentation of inaccurate visual materials is inexcusable.

The long established map-producing and distributing organizations, the names and addresses of which can be found in the leading teachers' and other educational magazines, offer very complete and economical service to schools. (See page 217.) There are some schools which are not able to purchase frequently revised maps in as complete sets as are needed to serve adequately. Those schools will do well to investigate the possibilities of preparing or purchasing map slides, for projection



on the blackboard or on any other suitable surface. Such slides may be constructed for as little as ten cents each in black and white, with but little additional cost for appropriate coloring or tinting.

The map slides which are available commercially are accurate in construction and are especially well adapted to blackboard work. These map slides have many advantages. They may be purchased cheaply, stored in small space, transported readily, and used for special place identification on blackboards without damage. There are other map slides available from various sources including aerial maps of sections and cities, product maps of various types, maps of national parks, river basins, and the like. The enterprising teacher can, with the aid of a good set of materials for making homemade slides, prepare the majority of the outline maps needed for any geography or history course, and will need to purchase only the detailed maps which have been prepared with greater accuracy.

McClusky, in his "The Place of Visual Instruction in the Modern School,"\* makes the following comments concerning teaching with charts, maps, graphs, and diagrams:

1. Advantages:

- (a) A peculiar product of the visual sense is the wealth of plane relationships which it effects. Pictures, maps, charts, graphs, and diagrams take advantage of this peculiarity. In miniature, outline, trend, or figure, they depict on a flat surface the essential properties of the real situation.
- (b) Maps lend themselves to classroom production. Among the possibilities are political, outline, relief, color—physical and contour maps. Pictorial maps are of special value in that they are symbolical.
- (c) A few charts summarizing the most important ideas and figures to be presented in a lecture or discussion can be made at small cost.
- (d) Graphs are of particular value in presenting statistical information.
- (e) The chart or diagram gives the teacher and class something in common as a focal point of attention.
- (f) They may be carried from place to place easily.
- (g) They are permanent and stand hard usage.
- (h) They lend themselves readily to use at a moment's notice, at almost any point where an audience may be gathered.

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\*McClusky, et al., "The Place of Visual Instruction in the Modern School."

## 2. Limitations:

- (a) The chart should be made large enough to be seen by all.
- (b) It is limited in the scope of material which can be presented by means of it.
- (c) Unless students have been trained to read charts, graphs, and tables, the instructor will have to spend considerable time in explanation. This results in (1) a considerable waste of time, and (2) a neglect of the content itself.

### *The Sand Table*

The sand table is probably the most adaptable of all visual aids. It may be used from the earliest preschool or play activities through all the grades, high school, college, university, in the army, in engineering, in landscape gardening, in real-estate selling, and in many other situations. Teachers of children in the lower grades may use it as a motivation project for reading and elementary mathematics. Teachers of higher grades may use it in geography, history, nature study, general science, agriculture, and hygiene.

The chief limitation of the sand table is that projects prepared on it are subject to disarrangement or destruction, if carelessly handled. Those who may desire more permanent contour maps or other projects will do well to use papier-mâché or a mixture of salt and flour. If modeling clay is available, it may be used successfully.

A good sand table for the average room should be approximately 8 x 4 feet in size, and about a foot in depth. The height from the floor should be determined by the average age of the usual group which will be using it and should be such that it will be accessible to all. It should be a little more than half filled with sand of an even texture, and provided with a small shovel to be used in moving larger quantities of the sand from one location to another. In many instances, it is desirable to have a backboard extending upward from eight to fourteen inches, for the purpose of providing backgrounds and for use in labeling the material prepared in the sand.

### *The Electric Map*

Another type of visual aid which contributes liberally to the learning process is the electric map. Either pictures or specimens may be used in the construction of such a map, and the wealth of material available in magazines and other publications offers an unlimited source. Insects, leaves, pictures of birds, animals, and the like may be used extensively.

The first requirement is a piece of fiberboard approximately 24x30 inches in size, or of any other desired dimensions. It is better to use something through which holes may be punched readily, as this will



Front of an Electric Map

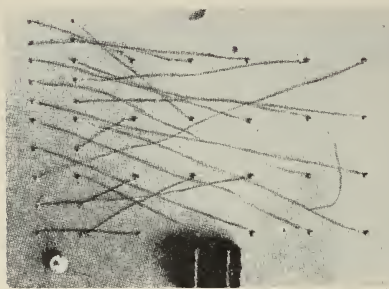
facilitate the construction of the map. In addition, the following will be needed:

- 40 to 60 stove bolts,  $\frac{1}{2}$  inch in length.
- One spool of No. 25 insulated copper wire.
- One "C" radio battery,  $4\frac{1}{2}$  volts.
- One automobile head lamp, 6 volts.
- The specimens to be mounted on the map.

This complete set of equipment will cost about \$1.50, and may be used over and over as needed. The smaller items may be secured at any radio or electrical shop and the plasterboard from a lumber yard.

The map which is shown in the accompanying illustrations was arranged to accommodate twenty specimens. Spaces approximately five inches square were marked off and bolts were put through the lower righthand corner of each square. The bolt was inserted from the back with the nut on the front of the map.

At the right side of the map, twenty bolts are placed in two rows of ten each. There should be as many bolts along this side as there are in the map. These two rows should be four or five inches apart and the bolts from one to two inches from each other in the rows.



Back of the Map

A piece of the insulated wire is used to connect one bolt in one of the two rows at the left of the map to one of the bolts at the right of the map, as shown in the illustration of the reverse side of the map. Remove enough

of the insulation from both ends of the wire to wrap around each bolt. The radio battery is wired to the base of the map on the back by running wires at right angles around the battery and through the plasterboard. Make a circle about one-half inch in diameter in the extreme lower left-hand corner of the board and insert the socket for the lamp.

Connect one of the terminals of the battery with one of the terminals of the lamp socket. On the other terminal of the battery, connect one end of a piece of wire which is long enough to reach all the bolts in the rows at the right side of the front of the map. To the other terminal of the lamp socket, connect a wire long enough to reach all the bolts in the lower right-hand corners of the specimen squares on the front of the map.

When the ends of both of the free wires are in contact with the two bolts which have been connected, for example, one on the picture of the butterfly and the other on the name of the butterfly, there will be a light.

Get a piece of two- or three-ply cardboard, the size of the plasterboard used for the construction of the outfit. Cut out small square holes in the cardboard, to fit over the nuts on the front of the map, as shown in the illustration of the front of the map. Then paste the pictures or the specimens in the square spaces to the left and above the nuts.

The correct names of the butterflies or other specimens used should be pasted immediately to the left of the nuts in the two rows at the right. This should be done accurately, and the person constructing the map should test the identifying names to make certain that they



correspond, through the wiring, with the specimens mounted in the larger spaces.

The pupil, then, may take one of the two wires in each hand, place one on the nut at the corner of the specimen which is to be identified and with the other, search among the labeled nuts at the right for the names of that specimen. When the correct name has been found and the two free wires are placed on contact with the nuts, there will be light when the circuit has been completed.

The electric map has been found to be a valuable aid in learning the names of objects, specimens, pictures, etc., as well as an effective device for testing such knowledge. In testing, students should be rated according to the number of attempts or trials required before proper identification of each specimen.

### ***Photographs and Prints***

The first development of photography was a device for recording a still picture—an ordinary photograph. The photograph has been and remains one of the most readily accessible, economical, and effective of visual aids to instruction. It is abundantly available and extremely useful. Its effectiveness is attested by its extensive use in advertising, periodicals, newspapers, texts, and all other printed materials and exhibits which are designed to attract and inform.

Pictorial materials, such as photographs, prints, magazine illustrations, post cards, illustrations in travel literature, and the like, are so abundant and inexpensive that no teacher should be without a liberal supply, particularly for teaching the various phases of the social sciences. Magazines such as *The National Geographic Magazine*\* and the various nature study and travel magazines contain illustrations which are carefully selected, accurately printed, and pertinent.

**Teaching with Pictures.** Pictures may be applied to teaching situations by the teacher or by the pupil. In many instances, the teacher will find a simple print to be much more effective in presenting a lesson than many minutes of discussion. The chief limitation of unprojected pictures is that they are difficult to use during a regular recitation period unless the teacher is fortunate enough to have one for each member of the class. Usually it is advisable to use single pictures during the study period, although fair results have been obtained by passing pictures from one pupil to another in an orderly manner.

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\*National Geographic Society, Sixteenth and M Streets Northwest, Washington, D. C.



Pupils may use pictures effectively in connection with presentations of various kinds. Ordinarily, the class recitation with which the pupil can use one or more carefully selected pictures is of much greater interest and value to both the performer and the listeners.

Two simple criteria to be observed in selecting pictures for either pupil or teacher use is to use only pictures which pertain to the subject and only enough pictures to illustrate the point clearly. Pictures which do not pertain to the subject are likely to detract seriously from the topic under consideration and too many pictures introduced into one lesson are likely to confuse the minds of the pupils. Frequently, one or two carefully selected pictures will be sufficient for an entire recitation.

Pupils should be given plenty of time to study pictures. Some pupils comprehend much more readily than others, therefore each pupil should be permitted to consider each picture at his or her own rate.

Pictures have been found to be highly effective when used to illustrate notes or as a part of a scrapbook for any given course. Pupils should be encouraged to use pictures in this way, including such drawings as they might desire to construct in explanation of points of discussion.

**Opaque Projection of Pictures.** One of the most desirable ways to use pictures for classroom instruction is to project them onto a screen by means of a reflecting or opaque projector. Almost any picture of reasonably small size can thus be projected before the group and studied, even including illustrations in texts. The apparatus required for this type of projection is described in detail on pages 49 to 51 and its possible uses and limitations are noted.

**Mounting Pictures.** Many pictures are wasted due to improper mounting or care. Many other pictures have their potentialities wasted due to the fact that they have not been arranged conveniently for proper utilization. Either situation is unfortunate and rather easily corrected, if the teacher will but spend a little time in the preparation of materials.

Pictures which are permitted to remain in magazines, pamphlets, or folders are comparatively inaccessible. Furthermore, they are easily damaged in handling. It is usually preferable, therefore, to remove such pictures from the publications and mount them on substantial card or mounting board. The process is not expensive and will add to the accessibility of materials. For example, if a single issue of *The National Geographic Magazine* contains air views of the cities

of Mexico, pictures of Central and South America, illustrations of interesting spots in Peru, and possibly a number of interesting scenes of Cuban life, these are all within a single cover and accessible only to one or two pupils at one time. It may be that one child will be interested in Peru, while another will want information concerning the cities of Mexico, and still a third will want to study Cuba. If the pictures remain within the magazine, one must wait for the other. On the other hand, if the pictures are removed from the magazine, mounted properly, and filed in an accessible manner, each will be able to have his or her study material at the same time.

One of the chief difficulties encountered in the mounting of pictures has been that of fastening the pictures to the mounting board in a permanent manner, without damaging the pictures. The majority of the ordinary forms of paste and mucilage tend to wrinkle the picture or cause it to bend out of shape when the paste is applied. A similar reaction occurs when it is applied to the mounting board—the picture curls one way and the board bends the other. The mounting must be done with haste and the mounted pictures placed under a press or weight to flatten them as they dry. If any of the paste or mucilage goes astray on the face of the picture or on the edge of the mounting board, it causes a serious stain.

These difficulties can be eliminated by using a very simple and inexpensive type of adhesive. It is only necessary to go to the nearest drugstore or stationer and purchase a small can or tube of clear paper or rubber cement. Usually a small bristle brush is furnished for convenience in spreading the cement. If not, any small, stiff brush will be satisfactory.

The technique for using rubber cement to mount pictures is very simple. If the cardboard on which the picture is to be mounted is  $8\frac{1}{2} \times 11$  inches in size and the picture approximately  $6 \times 9$  inches in size, a space on the mounting board approximately  $6 \times 9$  inches in size should be coated with a thin layer of the cement. The back of the picture should be coated similarly, and both should be permitted to dry—the drier they are, the tighter they will stick when put together. After both surfaces—the back of the picture and the front of the mounting board are dry, place the picture in position on the mounting board and press down firmly with a soft cloth or with the hands. The picture will adhere firmly and will so remain indefinitely.

The use of rubber cement for this purpose presents many advantages, three of which are especially worthwhile. In the first place, neither the picture nor the mounting board will warp or bend when the cement

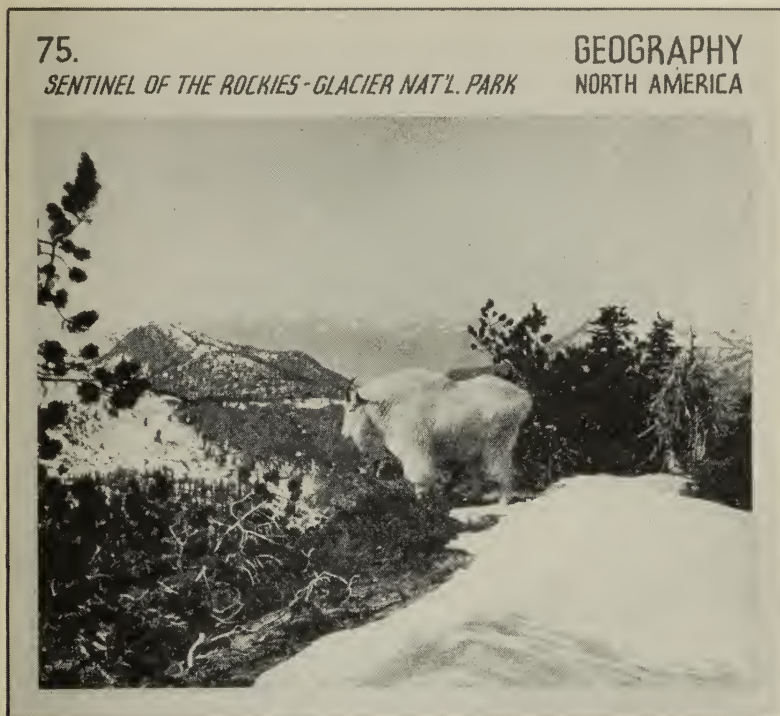
is applied. Both will remain flat and will join without any tendency to fold, wrinkle, or warp. Second, it is not necessary to rush the process of mounting and an interruption during the process has no disastrous effects whatever. If the person mounting pictures in this way should receive a telephone call or visitor, or should find it necessary to leave the material for any reason, the extra drying of the cement on the picture and on the mounting board will but cause it to adhere more firmly when joined. The third advantage is that the misapplication of some of the cement to the surface of the picture, or on the uncovered edge of the mounting board will cause no damage to either. It is only necessary to rub off the excess dried cement with a clean, soft cloth. Actually, the removal of excess cement in this way will tend to clean the surface of the picture or mounting board, rather than damage or stain either in any way.

Mrs. Charles Joe Moore, Secretary of the Bureau of Visual Instruction, University of Texas, has developed a very interesting use of cellophane to protect the surfaces of mounted pictures. The cellophane is cut in sheets slightly larger than the card upon which the photograph is mounted. It is placed over the front of the picture, with the overlap folded to the back, and cemented there. Thus, fingerprints and dust accumulate on the cellophane rather than on the photograph, and may be removed with a moist cloth.

**Filing Pictures.** Proper filing of pictures must be preceded by proper mounting. If the picture or mounts are of many different sizes, it will be extremely difficult to arrange any system of filing which will be truly satisfactory. The size of the mounting board should be determined by the size of the space available for filing the pictures. If no special size has been determined, two sizes which have been found to be very satisfactory are 5 x 7 inches and 8½ x 11 inches. These two sizes will accommodate the majority of the pictures available for mounting, and there are many filing cabinets for these two standard sizes. The mounting board should be stiff enough to support itself in a vertical position, but not so stiff that it will be cumbersome to handle.

After pictures have been collected from various sources and mounted properly, they should be made accessible to both teacher and pupil with the least amount of inconvenience. In some instances, it may be preferable to arrange the pictures in groups or sets, filing these sets in special envelopes, packets, or folders. Usually it is advisable not to include more than twenty to twenty-five in one group, as a very large assortment will have a tendency to confuse rather than to instruct.

Inasmuch as many pictures may serve for more than one purpose, i.e., for geography, nature study, history, etc., it is sometimes advisable to use a number system of filing, with a control card. A picture of "Sentinel of the Rockies," with only one print available, might receive



*Photo Courtesy U. S. Department of the Interior*

the number 75, and this number might be placed on control cards for geography, natural science, and elementary geology. In this way, pictures might be thoroughly cross-indexed and used frequently among different classes.

Each picture should have a name by which it can be classified, regardless of whether or not the number system of filing is used. In most instances, the name will be the only necessary identification, and the numbering will not be necessary. However, either the name or the name and number should be printed clearly in the upper right or left hand corner of the picture as it will be placed in the file. The identification can be either hand lettered on the mounting card, or



typed on a piece of gummed paper and stuck on the card. It is sometimes advisable, also, to indicate the subject for which the picture is best suited, providing an arrangement similar to the following:

75. Sentinel of the Rockies	GEOGRAPHY
Glacier National Park	North America

Identification and divisions can thus be made by continents, nations, regions, states, etc., as may seem desirable.

Once the filing order is determined—alphabetical or numerical—the pictures should be kept in that order at all times when they are not in use. Carelessness in filing causes inconvenience and waste of time in locating the pictures, thus decreasing the potential value of the material. Pupils can be taught to replace materials properly and the training will be valuable to them in later life.

**Distribution of Pictures.** If an assortment of pictures has been prepared by a teacher for use in her own subject or room, the problem of distribution does not enter. On the other hand, it is sometimes desirable to centralize the picture collection and make it available to all teachers who might desire to use it. The problem of distribution becomes, then, one of the matters to be given careful consideration. It has been found that when materials are distributed without proper records for checking, much of the material soon becomes lost and the service is impaired.

If the clerical help available is sufficient to permit the pictures to be filed and distributed individually as requested by the teachers, it would be preferable to do so. If such assistance is limited, it will prove economical to arrange the pictures in groups—carefully classified—and loan them to the teachers as units. The teacher may not want to use all the pictures in a group, but can select the desired ones, use these, and return the complete assortment at one time. As suggested previously, it would be desirable to limit the size of any one group of pictures to twenty or twenty-five, as it is seldom that more than that quantity of pictures can be used effectively in a single study or recitation period.

**Special Sets of Pictures.** Many organizations or agencies offer mounted and unmounted pictures and picture sets for sale. Some have been well organized and carefully selected. Others are simply in miscellaneous arrangement and must be selected and classified by the purchaser. There have been, however, some notable developments in the selection and organization of photographs for educational purposes. The list of picture sources on page 217 should be helpful.



**Historical Photographs.** One of the most unusual and most useful services of this type has been developed during the past few years in Hollywood. It is merely an adaptation of valuable pictorial materials to educational purposes, for which the producers deserve much credit.

In Hollywood, millions of dollars have been spent in research and reconstruction—research to determine the proper setting for historical dramas of all periods and the reconstruction of scenes for the production of those dramas. As the motion pictures are “shot,” still photographs are taken by expert cameramen. Some of these “stills” have been used for advertising purposes, but many of them have remained in negative files, unused. The majority of these pictures are as accurate, historically, as it is humanly possible to make them. These should be, therefore, valuable aids to those history teachers who may desire to bring true pictures of the past before the pupils of today; who desire to vitalize instruction by taking the pupil on a pictorial journey to the places and through the times about which he may read in the text and reference books.

A group of enterprising educators along the western coast has undertaken the job of organizing this vast storehouse of accurate and highly educational photographs into sets for instruction in history. The firm, Photographic History Service,\* has been organized to handle the details of production and distribution. Sets of pictures by the following titles are available for distribution:

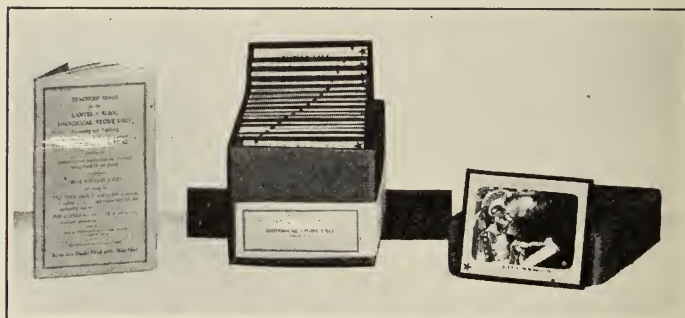
- Ancient Egyptian Life
- Roman Life
- Feudal Life
- The Vikings
- Elizabethan England
- French Revolution
- Arabian Desert Life and Culture
- Russian Life (up to the Soviet)
- The Pilgrims
- American Revolution and Origin of Government
- Daniel Boone Frontier Life
- Westward Movement
- Slave Life and Abraham Lincoln
- David Copperfield

The sets of historical photographs average fifteen pictures each, and are boxed in durable cartons of convenient size and shape for

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\*Photographic History Service, P.O. Box 2401, Hollywood, California.

handling or filing, or in bound volumes for reference table or library use. The photographic prints are 8 x 10 inches in size, mounted on durable cards  $9\frac{1}{4}$  x 11 inches in size. There is a full descriptive



*Photos Courtesy Photographic History Service*

### **Mounted Pictures and Duplicate Glass Slides, with Manual**

text below each picture. Other valuable accessories are included with each set. As explained in the announcement of Photographic History Service, the reason for offering the pictures in sets rather than individually, is as follows:

"These units were prepared to visualize the fact that life is a series of experiences, each of which is a cause or an effect of one of the others. Therefore, we have grouped and prepared them so the dramatic significance of the period would spring to life and the student or casual reader could enter into these people's daily lives and gain a balanced visual understanding of how they acted and why they succeeded or failed, thus making history dynamic and full of meaning for him.

"When this material was made available to us, many conferences

were held with librarians, visual directors, and historians covering the high points of each period—it was unanimously decided that the minimum number required was fifteen; that, in addition, a concise introduction was necessary to lay the proper background with a text under each to accentuate the principal points and broaden the subject; and for classroom use, a teacher's question guide to aid in bringing out a wide discussion."

Sets of the pictures are available, also, in easel-type bound volumes, prepared especially for the reading table in school or public libraries. In addition to preparing the sets of pictures and accessory materials for classroom and library use, Photographic History Service is now offering the same sets in glass slide form, accompanied by suitable explanatory material and other teaching aids.

**Geographical Pictures.** Another excellent series of pictures prepared especially for school use in the teaching of geography is offered for distribution by the National Geographic Society. The various pictures are grouped into what is known as the Pictorial Geography Series, including the following divisions:

- No. 1. Eskimo Life, and Sahara Life (48 pictures)
- No. 2. The Indian in America, the Negro in Africa (48 pictures)
- No. 3. Life in China and Hill Tribes of the Philippines (48 pictures)
- No. 4. Land, Water and Air (48 pictures)
- No. 5. The United States, General (48 pictures)
- No. 6. Italy (48 pictures)

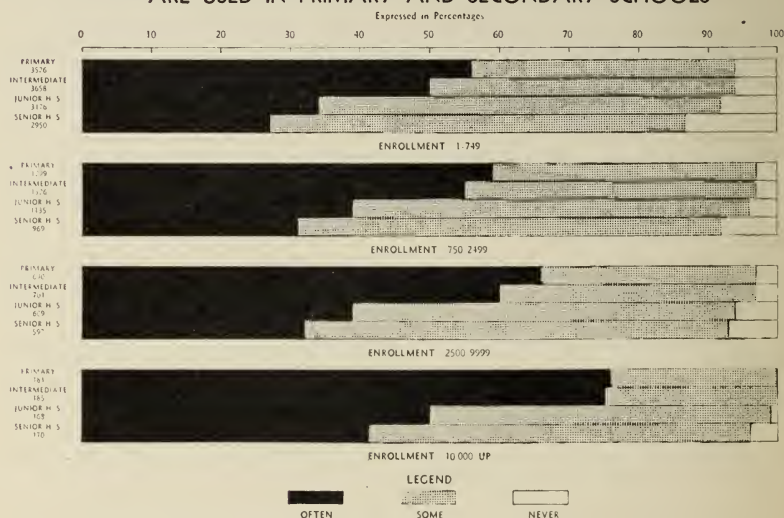
The pictures have been selected from the various issues of *The National Geographic Magazine*, so vary in size. However, the pictures and accompanying descriptive material are printed together on lightweight cards, 9 x 11 inches in size. The sets are available at very reasonable cost.

The descriptive material which accompanies each picture is prepared in simple language, so it may be read with understanding by pupils in the earliest geography and nature study classes.

In addition to this service, the National Geographic Society offers color sheets reproduced from various issues of the magazine, covering nearly every country in the world. These color sheets are printed on the usual magazine paper stock and are excellent for mounting purposes. In many cases there will be pictures on both sides of the sheets, so it will be desirable to order two copies or sets of each. The color plates are furnished at thirty cents for forty-eight sheets, or at fifty cents for ninety-six sheets, to be selected in small groups from a very large list of available subjects.

Another service of the National Geographic Society which should be of value to all schools is offered in the form of attractively bound books on fishes, birds, cattle, horses, wild flowers, wild animals, and

### EXTENT TO WHICH MOUNTED PICTURES ARE USED IN PRIMARY AND SECONDARY SCHOOLS



Graph Courtesy Office of Education (1936 Survey)

Washington, D. C. Complete information concerning this service will be provided on request.

**Pictures for Social Studies.** Another very interesting series of picture units has been prepared by the Informative Classroom Picture Association, Grand Rapids, Michigan. These units are designed especially for use in the social studies. In each unit there are twenty or more  $8\frac{1}{2} \times 11$  inch plates of artists' drawings which portray the information needed in teaching those phases of the social studies usually included in courses of study. Included in each unit are suggested approaches and activities which have been used successfully in classrooms. These provide the teacher with aids which may be adapted to an individual teaching situation. Correlated reading lists are also available and several thousand words of desirable teaching information supplement each teaching unit.

The units which are now available include the following:

- Pioneer Days
- Indian Life
- Life in Colonial America
- Knighthood—Life in Medieval Times
- Early Civilization
- Transportation
- Clothing and Textiles
- Christmas in Many Lands
- Our City—Home and Community Life

### ***The Opaque Projector***

The opaque projector is an instrument which projects on a screen by reflection any pictures, diagrams, and other flat or near-flat surfaces, which can be placed in the aperture of the instrument. It has many advantages, and certain limitations, which should be given consideration by those who desire to use photographs, prints, diagrams, and the like for classroom instruction in the most effective manner. The average opaque projector for classroom use ranges in price from \$100.00 to \$140.00, depending upon the type selected and the completeness of the instrument. It is light in weight and may be moved from room to room with ease.

**Advantages:** The greatest advantage of the opaque projector is that it will project almost anything onto a screen for group study or consideration. Furthermore, the pictures thus projected are reproduced accurately as to color. A color plate from *The National Geographic Magazine*, for example, may be placed in a good opaque projector and enlarged upon a suitable screen to almost any desirable size, without damage to the picture.

This leads, logically, to the extreme economy of the opaque projector. Materials for use in it may be collected from hundreds of sources, including books, magazines, post cards, travel bulletins, catalogs, or nearly anything which has in it an illustration worthy of class consideration. Ordinary typed material, drawings, diagrams, and graphic presentations of all kinds may be used in it quite satisfactorily. Although pictures in books and magazines may be projected without removing them from the books or magazines, it is usually more convenient to mount the pictures on cards. They can be handled more easily and will be available for individual study when desired.

A great advantage of the combination projector for opaque projection and for use of glass slides is that the change from one to the



other may be made almost instantly. It is possible, therefore, to supplement available glass slides with reflected pictures which the teacher might select for special teaching situations.



*Photo Courtesy Spencer Lens Co.*

### **Opaque Projector in Classroom Use**

It is possible, also, to secure a filmslide attachment for the opaque projector but usually desirable to secure a separate filmslide projector, in order that the two units might be used simultaneously in different parts of the building or school system. A filmslide attachment costs \$38.50 and good separate filmslide projectors range in price from \$25.00 to \$52.00, so the inconvenience of moving the entire projector from place to place in order to use the attachment is not offset by a comparable saving in cost. Accordingly, it is recommended that the more convenient separate filmslide projector be used.

**Limitations:** Although there are many points in favor of the opaque projector, there are some limitations which should be mentioned. The greatest, perhaps is that a rather thorough darkening of the room is necessary for opaque projection. Since the picture is reproduced by reflection rather than by projection, much of the light is lost. If the room in which the projector is to be used can be darkened thoroughly, the result will be rather satisfactory. In some

of the older school buildings, the matter of darkening brings into consideration the problem of ventilation. The newer buildings, with centralized and controlled ventilation, have eliminated this problem.

Another limitation, relatively unimportant, is that the opaque projector is more cumbersome to take from place to place than is the glass slide or film slide projector. Although this is true, the weight of the newer types of opaque projectors for classroom service has been reduced to the point where any pupil in the upper grades or any teacher can take the projector from place to place with ease.

Some of the older types of opaque projectors damaged some of the materials being projected, particularly if the pictures were highly colored. The leading manufacturers of these projectors\* have solved that difficulty by providing suitable ventilation for the smaller projectors, augmented by cooling fans in the more powerfully illuminated units.

### *The Stereograph and Stereoscope*

The stereograph is a picture which produces the impression of the third dimension—depth. The pictures on the stereograph are taken with a two-lens camera, approximating the views on the retinas of our eyes as we look at any object or scene in its natural setting. Although it is an artificial creation of the third dimensional effect, the stereograph gives us the nearest pictorial approach to the object itself in its natural setting. The observer really sees one picture with the left eye and another with the right. The right eye sees more of the right side of the object and the left more of the left side. The sense organs put the two pictures together and we see the whole object, thus giving the impressions of solidity and relief.

“The stereoscope itself is an optical instrument with a similar pair of lenses separated by a small wooden or metal partition to keep the right eye from seeing the left view and the left eye from seeing the right view. These lenses are arranged within a hood which fits over the eyes and tends to shut out the light and other possible distractions. When the stereograph is seen through this binocular instrument an impression of depth, or third dimension, is received. This gives charm and educational value to the picture, as it creates an illusion of reality and seems to transport one actually into the pictured situation. ‘We see something with a second eye and the mind feels its way into the very depth of the picture, around the object, and gets an idea of its solidity,’ said Oliver Wendell Holmes, who perfected this remarkable device.

\*For information concerning opaque projectors, write to the companies mentioned on page 217.

"The stereograph is, therefore, a photograph of an actual situation in life, not an artificial creation or stage setting built up for a special occasion. The lens of the camera in this case acts as an unprejudiced, mechanical eye. In studying a great painting we are able to see only what the artist visualized and reproduced on his canvas. The study of the stereograph is almost unlimited. Each time it is viewed, some interesting detail far off in the distance is revealed.



*Photo Courtesy Keystone View Co.*

#### A Telebinocular

"Through these interesting devices the great wonders of nature in the remotest parts of the earth are brought truthfully and vividly before us, and great personalities of history, like McKinley, or Roosevelt, or Wilson seem so real that we almost expect them to open their lips and speak. This element of truthfulness brings joy and delight to both old and young."<sup>\*</sup>

**Advantages:** The stereograph, as suggested in the foregoing, presents to the pupil a more nearly true concept of the object, person, or situation than could be obtained through the use of any other type of picture. The pupil is actually transported to the place where the picture was taken and sees the picture with a sense of being present.

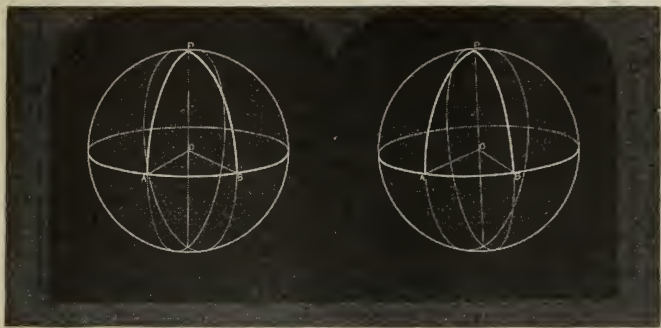
The stereograph is inexpensive, costing only about twenty-one cents for each view. Furthermore, there is an unlimited supply of excellent stereographs available. One large organization<sup>\*\*</sup> has devoted many years to the preparation of stereoscopic views of all parts of the world, including many excellent pictures for nature study of various types.

**Limitations:** The stereograph is an individual rather than a group teaching tool. Furthermore, it is sometimes difficult for students with defects of vision to receive the third dimensional impression. This is an unusual situation, but in some instances the use of the stereoscope will aid in detecting defects of vision.

<sup>\*</sup>Doris, Anna V., *Visual Instruction in the Public Schools*.

<sup>\*\*</sup>The Keystone View Company, Meadville, Pennsylvania.

**How to Use Stereographs:** "The stereograph gives a conception of reality that is not given by any other picture. The third dimension gives actuality of form and a strong feeling of intimacy. Its impression



*Photo Courtesy Keystone View Co.*

### **A Solid Geometry Stereograph**

on the pupil is tremendous. He feels that he is a part of the pictured situation. It lends itself particularly to individualized work. Only one pupil can see it at a time. To the keen teacher and supervisor, this is not a handicap but an asset. It makes necessary an emphasis on the individual aspects of education that have been so much neglected. Each pupil sees his own relationship to the pictured situation and brings to the class discussion his own thoughts on the subject. Through vivid presentations we are here cultivating original thought, favorable attitudes, and habits of active participation. No commonly practiced visual activity of the school can compare with that of a pupil closed off from the rest of the world by the hood of the stereoscope, lost in the contemplation of the realities of the stereograph.

"These realities, of course, deal only with the subject matter of the lesson at hand. The stereograph is most effectively used as a part of the study period in which definite problems are assigned. If the geography class, for example, is engaged in the study of anthracite coal mining, a number of views can easily be obtained that help give a concrete basis for classwork. This is the one important purpose of the stereograph—to build backgrounds of definite conceptions and interest that will make study effective.

"The stereograph furnishes intensive ideas. Its great values are its vividness and impressions of reality. The child gets strong impressions of acquaintanceship with the situation he sees in the stereograph.



Everyone remembers scenes depicted in stereographs he saw long ago. These facts are at the bottom of the educational urge to make a larger use of stereographs in education. At the same time, a careful analysis of these possibilities makes reasonable the suggestion that only a few stereographs, rarely more than one or two, should be presented at a time. In this way, vivid impressions will not submerge each other and the whole activity become confused, nor will the child get only the superficial and fleeting ideas that so often characterize his reactions to educational pictures of other types. To the stereograph can well be delegated in educational procedures the responsibility of conveying one definite and vivid impression at a time.

"Let us suppose that a half hour is set aside for the study of the geography lesson. The class is studying about Mexico. Certain references have been assigned for reading in connection with problems raised in a previous class period. The teacher has decided a certain two stereographs would be helpful. A pupil may be assigned to get these two stereographs from the cabinet. After inspecting them briefly and confirming her opinion that they will be helpful, the teacher puts them in stereoscopes and lets them pass around the room from hand to hand in some predetermined order. This is a matter of day-by-day practice and routine.

"While two pupils are looking at these views, the rest of the pupils are continuing their reading and study. Each member of the class in his turn inspects these two stereographs which contribute greatly not only to his actual information on the subject but also to his attitude toward it. Each pupil spends one minute looking at both the views, one half minute to each. This will permit sixty pupils to see each view during a thirty-minute study period. This is a greater number of pupils than the average teacher has to deal with in a study or recitation period. The class as a whole hasn't changed its normal procedure at all. And yet the whole activity has been marvelously vitalized by the real visual contacts each individual has had with the subject matter in question.

"This procedure can be varied as local conditions require. Some teachers prefer to have the views placed on a reference table and used by each pupil in turn as opportunity permits. The use of the stereograph need not be confined to the study period in which it functions definitely. It is difficult, however, to devise a simpler and more convenient, more effective method to use than the one described above.

"The stereographs may be used in the library by individuals, just as any other reference material is used. The views may be included in



the lesson assignment or the pupil may be encouraged to look up his own references. The individual use of the stereograph is most valuable, always, when it is followed by the group use of the lantern slide in class. A most effective use of stereographs is to assign to individuals definite stereographs to study, with a view to reporting with the aid of the duplicate lantern slide during the class period. Let us suppose that a study of cotton has been undertaken by the class. John and William are told to use a certain stereograph and to be prepared to report and show the corresponding slide at tomorrow's session. Mary and Betty are to report on another stereograph, and so on. Here again, the stereograph affords vivid and strong backgrounds for a real interest and attitude toward the subject and an appreciation of its realness and its significance.

### *Stereographs with Lantern Slides*

"Just as the stereograph is fundamentally an individualized type of equipment, vivid and full of meaning for the individuals who see it, so the lantern slide is adapted especially to group activity. Individual study should not proceed while lantern slides are being used. We are now in a socialized activity. Here is where one gets the pupil's reaction to complete preparation strengthened by the use of duplicate stereographs.

"Where stereographs are used from day to day, there is no use of the lantern slides that can compare with the review recitation. A record has been kept of the stereographs that have been used, let us say, on iron and steel. Now we get the duplicate lantern slides to review and summarize the stereographs which have given the pupils their impression of realness and clearness, and that have furnished such vivid conceptions of the pictured situation that will accentuate the pictorial values of the projected lantern slide. Pictures of scenes with which we are familiar always mean more to us. We put perspective and understanding into pictures of our summer home, and into the pictures of places that we have visited in far away lands. Our familiarity with the real places makes the pictures mean more to us than they mean to our friends. The boy or girl, standing at the projected lantern slide with pointer in hand, who has studied the stereograph, is in somewhat the same situation. He sees with eyes of interest and understanding that bring from him spontaneous self-expression and inspire class discussion unparalleled in any other situation.

"Stereographs are a wonderful aid to study and give the individual

pupil an unusual conception of the subject matter under investigation. But these vivid individual impressions and definite conceptions become infinitely more valuable when they are expressed in spoken language and discussed by a group. It is thus that facts and principles are fixed. The duplicate lantern slide is by all odds the best means of clinching fully the impressions and of bringing out the implications of the knowledge got by the individual from the stereograph.”\*

### *The Lantern Slide*

The ordinary lantern slide of American standard is  $3\frac{1}{4}$ " x 4" in size, and fits all the common slide projectors. It is usually composed of four or five parts: (1) the slide plate, or glass on which the picture has been printed; (2) a mat or mask, to keep the dimensions of the picture within the size of the aperture gate of the projector; (3) a cover glass, to protect the emulsion or picture of the slide plate; and (4) the binding tape, which is used to fasten the plate and cover glass together firmly and prevent dust or moisture from getting between and damaging the picture. The fifth part may be a piece of cellophane, a paper cutout (silhouette), a piece of Lumarith, a piece of thin paper, or a photographic positive on which a picture or outline has been drawn or printed for projection. In such cases, two cover glasses are used to protect the material in place of the usual slide plate and cover glass.

There are many variations of the above to meet different situations and conditions in which the slides are to be used. The lantern slide has become one of the most useful of visual aids and is being adapted to new purposes from year to year. The more recent development of 2" x 2" slides will extend the usefulness of slides into many situations where extreme portability of materials and equipment and low cost are important. An attempt will be made, in the following discussion, to call attention to the various types of lantern slides and their many possible uses.

### *Types of Slides*

**Paper Cutout Lantern Slides.** Children in the primary grades may make their own lantern slides to illustrate such stories as "The Three Bears," "The Boy and the Goat," etc. Let the children cut out pictures freehand, using lightweight black paper, or any other paper

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\*Hamilton, George E., "How to Use Stereographs and Lantern Slides." Reprinted from *Educational Screen*, November, 1926.

which will prevent the light of the projector from passing through. Then select the best cutouts and let the children paste them on ordinary cover glass. This gives a silhouette effect when projected on the screen.

The illustrations on this page indicate types of silhouette slides



*Photos Courtesy Society for Visual Education, Inc.*

#### **Paper Cut-out or Silhouette Slides**

which may be prepared by pupils. These pictures carry a definite message which contributes materially to the subject of study. The spirited enthusiasm among the pupils who are permitted to make these slides and project them before the class is certainly evidence strong enough to warrant the use of such materials whenever possible.

**Etched Glass Slides.** There are three principal kinds of etched glass slides. First of all it may be well to explain that etched glass is simply a piece of glass of high quality, one side of which has been roughened or etched by the use of acid or by some other method. This roughening of the otherwise slick surface of the glass provides a surface which may be used for pencil outlines or crayon work, neither of which would be satisfactory on the smooth glass.

There are numerous advantages to the etched glass slides, particularly in those cases where the material on the slide is to be used but once or for a short time only. In the first place the etched glass may be used over and over again as the pencil or colored outlines on it may be removed with soap and water or with a solvent for the colored ink, leaving the surface just as clear as it was before use. In the second place, the ease with which the etched glass slide may be used for pencil outlines causes it to be one of the preferred types for rapid work in slide making. Another convenience of the etched glass slide is that it need not be protected with a cover glass unless it is to be kept for

permanent use. It is extremely important that high quality etched glass be used for the best results, and the best glass for this purpose costs approximately ten cents for each piece of slide size ( $3\frac{1}{4}$ "x4").

**Etched Glass Slides Using Colored Pencils.** One of the simplest types of pupil-made lantern slides is made by using special water color pencils on finely finished etched glass. A set of six colored pencils will cost but fifty cents and may be used for producing hundreds of slides.

The following suggestions will be helpful in making etched glass slides:

1. If the picture to be reproduced is a freehand drawing, it is advisable to draw it first on a piece of paper,  $3\frac{1}{4}$ x4 inches in size. If a picture less than this size is to be reproduced, it will not be necessary to make a sketch of it. If the picture is larger than the slide size, it is usually possible to select the most important part of the picture and use it. The important details of the picture should be kept within a space approximately  $2\frac{1}{4}$ x3 inches.

2. Lay the piece of etched glass on the drawing or picture and trace the details in outline with an ordinary medium or hard lead pencil. Mistakes in pencil marks may be removed with art gum.

3. Color the picture with lantern slide pencils.

4. If it seems desirable to preserve the picture for future use, place a piece of plain cover glass over the colored drawing and bind the edges with lantern-slide binding tape. A piece of tape fifteen inches long is required to bind the slide glass all the way around. Wet the tape. Place it on a flat surface with the sticky side up. Hold the two glasses tightly together and place on edge in the middle of one end of the tape. Turn the glasses along the tape, being sure the edges are being kept in the middle of the tape, which will stick to the glasses. Then press the edges of the tape over the edges of the glasses and they will be bound securely.

If the slide is not to be used again, it will not be necessary to use the cover glass or the binding tape. Furthermore, the pictures may be removed by using a little Dutch Cleanser or similar washing powder with water, or by using a lead pencil eraser on the dry glass. A small bristle brush will be helpful if the slide is washed.

**Etched Glass Slides Using Colored Inks.** The chief advantage of the slides made with colored inks, over the slides made with colored pencils, is in the brilliance of the coloring. By thinning the lantern-slide ink with water, beautiful light variations of the six colors may



be obtained. Furthermore, these colors may be mixed to form any desired shade or tint. An assortment of six colors of lantern-slide ink may be purchased at a cost of \$1.50.

It is possible to use the lantern-slide ink on plain glass. The ink adheres to etched glass better, however, so it is recommended that the etched glass be used in most cases. Inasmuch as the colored lantern-slide ink is more difficult to use than the colored pencils, it is recommended that the ink slides be made by advanced students or by the teacher. If the slides are not to be used again, the pictures may be removed by using ordinary soap and water.

The usual procedure to be followed in making ink slides on etched glass would be approximately the same as for making the pencil slides. A small brush or pen should be used to color the outlines of the picture. If the ink seems too thick or too dense, thin it with water.

A second-grade class was studying "The Science of Spring." One of the activities which grew out of the unit of work was to make lantern slides of fifteen different birds they had observed and studied. They used the colored inks and made slides of the red-headed woodpecker, red-winged blackbird, cardinal, blue jay, meadow lark, robin, and bluebird. Only the most prominent colors were painted on each bird. The unit of work was finished by giving an assembly. As each slide was projected on the screen, a pupil gave a report of the different things learned about each bird.

**Ceramic Pencil Slides.** The ceramic slide is a type of lantern slide which the children in the primary grades may make most successfully. Either cover glass or etched glass may be used, although the etched glass is more satisfactory. Cover glasses must be absolutely free from dust and corrosion or the pencil will skip across the surface without leaving an impression on the glass. It is possible, however, to coat ordinary cover glass with a thin emulsion of clear shellac to provide a surface on which one may write with a ceramic pencil, with India ink, or tint with water colors. The shellac can be obtained at any drugstore in small quantities, and should be thinned to about one half the usual consistency.

After the slide thus made on the shellacked cover glass has served its purpose, it is very easy to dissolve the shellac and wash off the picture with industrial alcohol or any of the other common solvents. Then the cover glass may be coated again and used for making another slide.





**Cellophane Lantern Slides.** The cellophane lantern slide is made by slipping a small sheet of cellophane,  $3\frac{1}{4} \times 4$  inches in size, into a folded sheet of carbon paper and then typing on the cellophane sheet, through the carbon paper. If the typewriter does not give a good, clear impression on the cellophane sheet, remove the ribbon to permit the bare type to strike the carbon paper, as when cutting stencils.

The copy should be planned carefully and typed on paper, confined to a space approximately  $2\frac{1}{4} \times 3$  inches in size, before an attempt is made to type it on the cellophane. In that way, the appearance of the slide may be made attractive by the use of proper spacing and arrangement of items to be included. It will be best to confine the copy to thirteen lines of single-space typing with thirty-two or thirty-three spaces to the line. The typing should begin at least one-half inch from the top of the cellophane sheet and three or four spaces from the left edge.

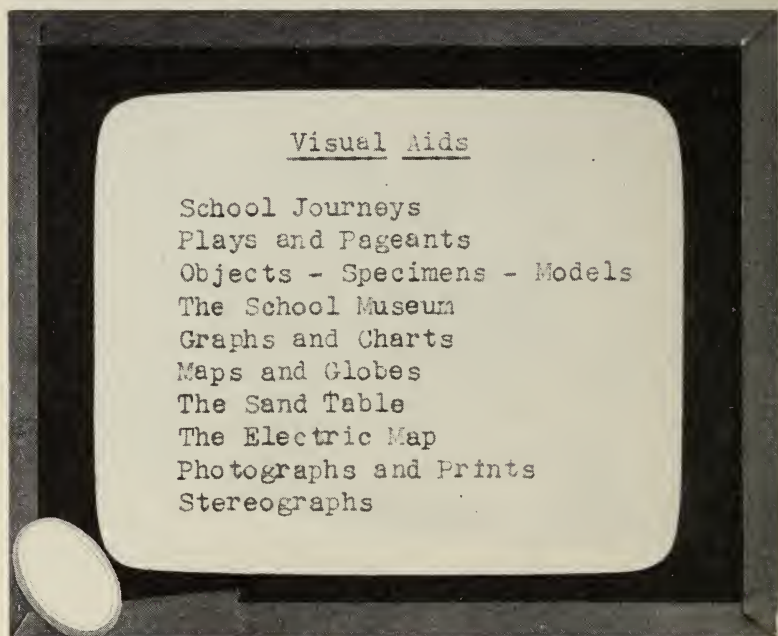
The typed cellophane sheet is then separated from the carbon paper and bound between two pieces of plain lantern-slide cover glass. The binding tape may frame it entirely, or a small piece of tape on each edge will hold the glass firmly, if the slide is not to be preserved for future use. Hand written material, drawings, tracings, etc., may be imprinted on the cellophane sheets in a similar manner, by using a hard pencil or a stylus.

The cellophane slide is a valuable teaching tool in the hands of the busy teacher. All sorts of reading exercises, outlines, and other matter, usually printed or written on the blackboard, may be put on such slides and kept for repeated use. Furthermore, pupils in the intermediate and advanced grades, including those in high school and college, may use the cellophane slides to good advantage in preparing reports and classroom discussions. The materials used are inexpensive and the results of their proper use are limited only by the energy and ability of the teacher.

It is possible with the medium or heavy sheets of cellophane to trace from drawings or other outlines on the cellophane with India ink. Sometimes it is a little difficult to hold the cellophane in place while the tracing is being made, but this piece of cellophane placed between cover glasses makes a very satisfactory projected outline or diagram. Those who may have an excess supply of cellophane and a limited number of cover glasses may make up a series of slides on the cellophane sheets and simply insert these between two cover glasses which have been hinged with binding tape along one side. In this way two or three pairs of cover glasses will provide equipment

to be used in showing a long series of the cellophane slides.

On all types of slides, made by either pupil or teacher, a margin of approximately one-half inch should be left around the edges in



*Photo Courtesy RCA Manufacturing Co., Inc.*

**Cellophane Lantern Slide (Actual Size)**

order that all the typed or written material may be included in the field of projection. When hand lettering or writing is to be done, cross-sectioned paper laid under the glass will provide horizontal and vertical guide lines.

**Lumarith Slides.** A new material, which has been developed for industrial purposes, but which is highly satisfactory for homemade lantern slides, is known as "Lumarith." It is produced by the Celluloid Corporation\* and the etched Lumarith is quite similar in appearance and convenience to the etched glass. It is made of cellulose acetate, so it creates no fire hazard even when subjected to excessive heat. The material is available only in sheets approximately 20x50

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\*Celluloid Corporation, 290 Ferry Street, Newark, New Jersey.

inches in size if ordered directly from the company, and these sheets range in price from 55c to \$1.50 in the weights ordinarily used for slide making. They may be cut to size on an ordinary paper cutter.

**Photographic Lantern Slides.\*** It is extremely difficult to avoid confusion when mentioning the various forms of lantern slides to those who are not familiar with some of those forms. The term "photographic" is used here for want of a better one to designate those slides which are made by transferring images to sensitized glass-slide plates. This would include the majority of the slides which are prepared for sale, and many of those which are made by teachers for their personal use. In many cases, advanced pupils derive much pleasure from this type of work and produce excellent results.

The making of photographic lantern slides is a most fascinating undertaking and yet a rather simple process. For the beginner, the following procedure and materials have been found to be very satisfactory. After a few trials, and following directions closely, the technique will be mastered and the results will be highly satisfactory. It is well to use these simple materials until the proper handling of them has been mastered. The materials here recommended are no better, perhaps, than others on the market, but excellent results have been secured by using these, and, after the slide maker has learned the fundamentals, he may select the materials which he believes will suit his situation best.

**Equipment.** The first essential is a darkroom. Any room which can be made absolutely dark and which has running water in it may be used as a darkroom. There should be two types of electrical lighting equipment in this room; a Wratten Series "O" or a "ruby" light to be used when handling the sensitized plates; and a frosted 25-watt tungsten lamp to be used in making prints from the negatives. The light switches or controls should be placed on or near the workbench, so they may be convenient at all times.

Two white enameled pans, approximately 6x8 inches in size and 1½ inches deep, will be needed. One of these will be used for the developing chemicals and the other for water. In addition, there should be one enameled pan, approximately 20x24x3 inches in size, to contain the "fixer." An ordinary sink or some other form of tank will be needed as a place in which the slides may be "washed" as part of the process. A simple slide rack, in which the slides may be placed while drying, is essential.

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\*Heathershaw, Lillian, "Simple Directions for Making Visual Aids." *Educational Screen*, 64 East Lake Street, Chicago, Illinois.



**Lantern-Slide Plates.** The Eastman or any other "slow" plate is the type which will prove to be most satisfactory for the beginner, as it is less sensitive to light than other types. The plate is a piece of clear glass,  $3\frac{1}{4} \times 4$  inches in size, one side of which has been sensitized by coating it with an emulsion composed of silver bromide and silver iodide dissolved in gelatin. The emulsion side is the dull side of the slide. The slides are packed in boxes of twelve and the boxes should be opened only in a darkroom. Furthermore, it is important that the boxes be kept tightly closed at all times except when the room is thoroughly dark or illuminated only by the red light.

**Negatives.** Any negative which will make a good print will make a good lantern slide. The lantern slide is merely a positive print of the negative used. When making contact prints, it is necessary that the negative be approximately  $2\frac{1}{4} \times 3$  inches in size, or that the essential part of the negative to be transferred to the glass slide be confined to those dimensions. If materials are to be photographed for transfer to glass slides, it will be well to use a camera which accommodates a negative  $2\frac{1}{4} \times 3\frac{1}{4}$  inches in size. Any size of picture may be transferred to a lantern slide, of course, but the use of the smaller negative will tend to eliminate one or two processes. There are lantern-slide negatives on which drawings, photographs, etc., may be recorded, and these same negatives may be used over and over again in the production of additional slides of those subjects. The beginner should learn the simpler processes first, however, and the more difficult procedures may be accomplished later.

**Contact Printing.** As mentioned above, this is a very easy method for the beginner, and very satisfactory. Simply place the emulsion or dull side of the lantern-slide plate against the dull side of the negative from which the picture is to be made and hold each against the other firmly by using an ordinary printing frame, with the plate below the negative. The 25-watt frosted tungsten lamp should be suspended about six feet above the workbench and, after the negative and plate have been fixed firmly in place, should be snapped on for about fifteen seconds. Turn out the white light and continue with the developing process, using only the ruby light.

**Developing.** One of the simplest developing solutions is prepared by using "Nepera," or any other developer in which the various chemicals are ready mixed. This developer is available in eight or sixteen ounce bottles and is inexpensive.

Mix up about one-half pint of the solution, using one part of



Nepera by volume with four parts of water. Place this solution in one of the small enameled trays. This quantity will be sufficient for developing sixteen to twenty slides, but should not be saved from day to day. After the lantern-slide plate has been exposed, remove it from the printing frame and slide it into the tray of developer, emulsion side up. The plate should be left in the developer from one to two minutes, and only experience will make it possible for the worker to determine just when it should be removed. It should be left in the solution until the picture shows clearly on the back of the plate. Usually further development will produce a fog.

**Fixing.** After developing, the slide should be rinsed in plain water and then placed in the acid fixer. It should be left in the fixer for twenty minutes. The fixing compound or "hypo" is available in one-pound packages. The contents of a package should be dissolved in two quarts of water, following the directions which are printed on the outside. The "hypo" may be used several times and this quantity will fix about a hundred slides. The solution should be kept in a brown bottle or jar, which may be covered tightly, and should be stored in a dark place.

**Washing and Drying.** After about twenty minutes in the fixer, the slides should be placed in a tank and washed in running water for ten to fifteen minutes and then placed in a rack to dry. When more advanced work is attempted, it will be necessary to control the temperature of the solutions and water rather carefully; but for this elementary work, the usual temperature of tap water will be satisfactory.

**Mounting Slides.** When the slide plate is thoroughly dry, it should be projected in a lantern for examination. If it is clear and satisfactory, it is ready to be mounted for permanent use. A mat, which is a piece of black paper  $3\frac{1}{4} \times 4$  inches in size with the center cut out in any desired shape and size, is placed next to the emulsion side of the slide. The opening in the mat is usually  $2\frac{1}{4}$  or  $2\frac{1}{2} \times 3$  inches in size. After placing the mat in position, a piece of cover glass,  $3\frac{1}{4} \times 4$  inches in size, is placed over it to protect the emulsion from damage. The slide plate, the mat, and the cover glass are then bound together with a strip of binding tape.

If the mat has on it a small white or gilded spot or star, this spot should be placed at the lower left-hand corner of the plate. If there is no such mark on the mat, a small spot or square of gummed paper should be placed on the outside of the cover glass in the same position. This spot will serve as a "thumb mark" to the operator when

the slide is being projected in the lantern.

**Coloring Slides.** Lantern slides may be tinted slightly by soaking the plate in water which has been colored with pieces of Japanese water color stamps. If further tinting is desired, transparent water colors will be satisfactory. The proper coloring of lantern slides requires both patience and skill, but successful results will more than compensate for the time and energy involved.

After the pupils have made slides successfully, using the above process, they may take up the reducing and enlarging of negatives to the proper size for use in making lantern slides. This will require more equipment. The reduction and intensifying of slides may be learned. It is better, however, to try to make the negatives so well that these processes will not be necessary.

Pupils should be encouraged to make photographs of subjects which may be used in science, geography, history, agriculture, and other classes. Many subjects, such as wild flowers, birds, trees, plants, and animals may be photographed in summer and the pictures transferred to slides for classroom use in winter. The production of lantern slides is an excellent activity for a science club or a camera club. As soon as one or two pupils learn the process well, they will be glad to assist other small groups of pupils and to make special slides for classroom use. Perhaps the club may be given an opportunity to arrange the program for an assembly, at which time the slides can be used.

**“Positive” Lantern Slides.** Those who may desire to use lantern slides of the same quality as photographic slides and find it necessary to keep the cost of production as low as possible and to reduce the weight of the materials to a minimum, will find that lantern slides made of positive film prints will serve these purposes well. The process is simple. It is only necessary to transfer the picture negative of slide size to a positive film of the same size and place the positive print between cover glasses. Two or three pairs of hinged cover glasses will be sufficient to use in projecting a long series of the positive prints, so a package of fifty to a hundred prints and the hinged cover glasses could be placed in the space ordinarily occupied by eight or ten slides. The process of making this type of print is quite similar to that of making photographic slide plates, except that positive film will be used rather than sensitized glass plates.

**Advantages of Glass Slides.** As the reader may have gathered from the foregoing statements, the glass slide offers the most com-

plete array of opportunities for the use of projected still pictures. A further advantage of the glass slide is that a carefully constructed slide either of the homemade or of the commercial variety offers the maximum of brilliance in the projected image. Another great advantage of the projected slide is that the image remains absolutely steady, and it may be left on the screen for any desired length of time. In those cases where the slide is being used for testing purposes, it is possible to time accurately the period of projection. In this way it is possible to adapt the slide to research projects in which it is desirable to control the time element.

The greatest advantage of the glass slide over the majority of the other projected visual aids is that it may be used quite successfully in a room which has not been darkened thoroughly. There has been much said about daylight projection, and approximately 90 per cent of what has been said should be discounted as being enthusiastic misrepresentation. There is no projected picture which will compete successfully with the interference of sunlight or very direct daylight. There are all sorts of schemes which may be used to secure a reasonably clear picture under adverse conditions where the light may not be subdued, but it is usually desirable to darken the room to a reasonable extent. This is not necessary, of course, with the outline slides such as the outline maps of states, countries, or continents, nor is it necessary when using slides made from diagrams, typed on cellophane or other homemade slides with distinct outlines. If slides containing great varieties of shadings or colorings are used, however, it is not desirable to project them in a well-lighted room. The results are not the best, and in most cases it is but a small task to shut out interfering light. In those cases where it is practically impossible to shut out light interference, the glass slide will be found to be the most successful competitor with that light, and may be used under conditions which would practically eliminate the other forms of projected pictures.

Those who are considering visual instruction materials should give some attention to the availability of the type selected. An unusual type of visual aid, even though it may be very satisfactory, may prove to be an unwise investment due to its unavailability in various sections of the country. The glass slide is almost universal in its availability, and the majority of the service bureaus which have visual aids available for loan have very complete assortments of well-organized glass-slide sets.

Another convenience of the glass slide is that it may be made from almost any type of drawing or photographic negative. Simple camera

negatives can be transferred to photographic glass slides with ease. The process may be learned in a short time, and the enterprising teacher will be able to prepare, during vacation periods, much excellent ma-



*Photo Courtesy Spencer Lens Co.*

### **Routine Use of Slides**

terial to be used through the academic year. The preparation of such materials should be of special interest to geography, nature study, and agriculture teachers who find many situations during the summer providing desirable teaching material to be used in winter classes.

**Purposes Slides Serve.** There are several purposes which lantern slides may serve in the usual teaching situation. They may be used in the consideration of any topic to stimulate interest or to introduce the new subject matter. They may be used to develop a background for the material to follow, either in discussion or in the presentation of other types of visual aids, including the motion picture. They may be used during the discussion or study periods to clinch essential facts, to present vocabulary in the teaching of reading, or to help timid children recall facts they wish to emphasize in connection with class-work. They may be used at the close of the discussion of any topic as a very effective review. The time and place for using the projected slides will need to be determined by the teacher in each situation. A



little experience with the use of these materials and it will not be difficult to know just when each will prove to be the most effective.

One of the greatest purposes served by the glass slide is that of giving training in expression and self-reliance. Homemade slides are very easily constructed either by the teacher or by the pupils. In most cases they will serve more effectively if constructed by the pupil for the purpose of illustrating his or her report to a class. A pupil in the school who has constructed an outline slide of the Panama Canal Zone, and who has been assigned the task of explaining the location and importance of the Zone to his geography class will handle the work with much more personal interest and zest than if he is obliged to lead the same discussion without the aid of the projected material. These talks on individual slides by pupils in classes may be utilized effectively in many different subjects, regardless of whether or not the pupils may have prepared the slides. Anything of this sort, which will tend to develop self-reliance and expression on the part of the pupils, will be of great value in the training of those who participate.

Glass slides are being used in some of the larger cities to accompany radio lessons. In this way it is possible for an art supervisor, for example, to give a discussion of three or four noted paintings over a central radio station, so the discussion may be received in thirty to fifty school buildings where the slides are projected before classes. It would be impossible for the same person to reach those groups by traveling from school to school, but by broadcasting the discussion it may be almost as effective and certainly a very efficient way to handle an otherwise crowded schedule.

In certain courses it is possible to project typed slides on the blackboard or on a screen in the front of the classroom for the purpose of comparing the work of students or to make corrections. In all these uses of slides or other projected pictures, the chief advantage is that the attention of the entire group is concentrated upon the main topic of discussion. A single projected picture in the front of a darkened room will attract the attention of even the most inattentive in that room and, if properly presented, will hold the attention through the discussion period.

**Limitations of Glass Slides.** Although glass slides are the most efficient of the projected visual aids from the standpoint of illumination and clearness, there are certain limitations which should be mentioned in any fair consideration of them. In the first place, they are rather heavy to transport from one place to another or to store in quantity. Shipping costs are higher than the cost of shipping almost any other



type of visual aid. Another limitation is that they must be handled with care in order to avoid breakage. Although there are some slides so constructed as to be practically nonbreakable, the majority of the slides of that type leave the emulsion side of the glass unprotected, except for a thin coating of shellac, and there is danger of damage from scratching.

Glass slides require more space for filing or storage than some of the other materials for still projection. They cost considerably more than film slides or miniature slides, but, if handled properly, will give almost unlimited service.

**Suggested Uses of the Lantern Slide.** McClusky,\* in his outline of a proposed text in visual instruction, suggests the following as a guide to those who desire to make the most effective use of slides:

1. The lantern slide lends itself admirably to socialized activities. Because of its "group appeal," it makes group consideration of a subject practical in large classes. Many unprojected pictures are too small to be seen distinctly by all. The lantern slide may be seen by every child in the group while discussion is taking place.

2. The lantern slide focuses the attention of a group of pupils.

3. The lantern slide stimulates reflective thinking. It is possible for the teacher to control the length of time the picture is exposed so that the class may concentrate on each feature as long as is necessary.

4. The slide is flexible. It lends itself readily to being correlated with the subject matter under immediate consideration because any portion of a series of slides can be shown when needed without running through any other portions. It is also possible to refer to the same slide several times during the course of the lesson, because of the ready accessibility of each slide.

5. The slide provides an admirable means of reviewing a topic. It "tests the ability of the pupil to discuss a topic in a clear, vivid way." Slides may be referred to again and again.

6. The ink, pencil, ceramic, silhouette, opaque, and cellophane lantern slide may be made by teachers or pupils. It is thus possible to "show only what is required without any distracting features." The economy of homemade slides makes them readily available to all teachers having access to a projector.

7. The smallest number of slides required to develop, or interpret the concept is the number of slides to be used. If one will do it, that

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\*McClusky, F.D., et al, "The Place of Visual Instruction in the Modern School," (Syllabus of a proposed text).

is the number to be used. If more than one is required, the thought unit must be kept down to such a size that confusion of ideas will not result. It should be remembered that these experiences are to be remembered the same as new words in spelling, new combinations in arithmetic, etc., so they can be recalled later and the imagery used in later thinking.

8. By projecting the picture on the blackboard, all sorts of markings may be made on the picture and erased without affecting the picture. This holds true not only for writing or printing words on the part of the picture which they symbolize in reading; but also such markings as are needed to explain operations, motions, special points of interest, etc., in the upper classes of junior and senior high school and college. By this means the need for the motion picture may be reduced.

### ***Teaching the Child How to Look at the Slide***

1. The child, to understand and interpret the pictures so that he can use the knowledge thus acquired, must be taught how to look at the slide so he will not talk about the first thing he sees. When the child has clearly defined his aims or problems, he is ready to select from the picture that which answers or explains the subject under consideration. He will recognize other things, perhaps irrelevant, about which he would like to know more. These become subjects for further individual or class investigation. There should be some use of the stereograph in connection with the slide in the very early grades to teach the children the significance of lights, shadows, and of flat pictures. The pupils should be taught to expect a slide or stereograph to be used repeatedly, each time studying only the part of the picture that has significance for the problem at hand.

2. There are several technical points about a picture which it is well to train the child to recognize readily:

a. The slide which is to carry an unfamiliar message is of greatest value when there is something in it which is known. A person, automobile, or house is essential in some types of pictures if an idea of height, size, or distance is to be grasped.

b. Help the child to gain the habit of always looking for something of which he knows the size and then using that to help interpret the picture. The viewpoint or scope of the picture should be established, whether it is a near view including a few persons or objects, or a distant view covering a large area. In the case of mountains, the altitude at which the picture was taken is important in order to comprehend the heights of ranges and peaks. For placing the picture

in correct location, time, or situation, the child gains the ability to recognize a few simple fundamental geographic, historic, scientific, and human principles. In using a known object as a basis for judging sizes of unknown objects, it should be noted that the unknown object must be the same distance from the camera as the known. Unknown objects in the distance should not be compared with a known object close to the camera. This is obviated in stereographic projection, which is three dimensional.

3. The training of the child's imagination and emotions, as well as the intellect and will, is essential so he will unconsciously feel and respond to that which is lovely and true in pictures, whether in or out of school.

4. Knowing how to look at pictures is not gained in a short time. It is the gradual recognition by the child of a group of principles and the ability to apply them. A very great amount of care should be taken by the teacher not to analyze a picture to such an extent that the meaning is destroyed. The teacher's part in helping the child interpret a slide is that of guide.

**The Slide Lesson.** The aims of individual lessons or a series of lessons determine the use of the slide.

1. In development lessons, the slides which show causes from which results can be deduced, or those which show results in such a way that causes can be investigated or the results be seen as further caused, are valuable. This means a psychological arrangement of the slides.

2. In a travel lesson, the need of a logical sequence of pictures is obvious either following the route or the central theme or purpose of the journey.

3. In the appreciation lesson of literature or art, slides are very valuable in creating an atmosphere, interpreting the life of other days, including the fairy realm, and in learning to enjoy the beautiful.

4. In some cases, drill lessons are not needed as much when using slides, because the desired information is kept before the child and thus in constant use.

5. Slides give a new view to a concluding or review lesson.

6. A great deal of value and power is gained through interpreting the slide in the socialized recitation.

7. Perhaps one of the greatest uses of slides is as a means of creating a situation and an atmosphere from which individual or class problems or projects can grow and develop.

As suggested before, there is no set time for introducing the slide in the process of teaching a unit of instruction. The slide, depending somewhat upon its type, may be used to introduce a subject; as a part of the study or discussion period; or as a review at the close of a unit of instruction. In each case, thorough discussion and questioning should be provided and permitted.

One of the chief features to be emphasized in connection with the use of slides, or of the majority of the other visual aids, is that the materials and equipment should be readily accessible. If it is necessary for the teacher to go to another school building, or to spend an unusual amount of time locating the projection equipment, and still more time locating the materials, it is quite probable he or she will become discouraged and will fail to make proper use of the materials desired. The ideal situation would be one in which each teacher could have in her room or department a projector and an assortment of slides, including the majority of the slides to be used in connection with her classes. In such a situation the teacher would be able to do her work more effectively with a decided economy of time. Certainly there should be at least one projector in each school building. If it is not possible to assign a projector to each department which will make use of it, the projector should be kept at the principal's office and should be ready for use at all times. It may be desirable to centralize the slide library in the school museum or school library, keeping the projector with the slides, but with the assurance that someone is responsible for its proper care and adjustment.

There are many excellent slides available for sale and for loan to those who may desire to use them. Some of these slides are such that no substitute could be provided. On the other hand, very effective teaching with slides can be accomplished with homemade materials. Pupils may make their own slides or the teachers may make slides to illustrate certain points. The pupil-made slides are particularly effective inasmuch as they call for the exercise of the creative ability of the pupil and provide the effective phase of education—an opportunity for participation and self-expression. Every classroom in which the regular use of slide materials is attempted should be equipped with a homemade slide outfit.\*

An outfit for making homemade lantern slides which would be sufficient to provide 150 to 200 slides costs but \$14.50 including a very convenient wooden case for the storage of materials. It is exceptionally

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\*Keystone View Company, Meadville, Pennsylvania.



useful. The outfit contains cellophane sheets, carbon paper, etched glass slides, cover glasses, colored pencils, colored inks, and a sufficient quantity of binding tape to make 100 slides. As certain materials may become exhausted, replacements may be made at reasonable prices.



*Photo Courtesy  
Keystone View Co.*

#### **A Slide-Making Outfit**

Sometimes it is desirable to have pupils make slides on a competitive basis and to let the members of the class select the best of any subject or series. This tends to develop a perfection in slide making which will be of value to the teacher by providing excellent materials for future use. This experience will be of greater value to the students themselves as a knowledge of slides and slide making will be extremely valuable in later courses.

**Standards Slides Should Meet.** There are certain standards which should be applied to the selection of all types of projection materials, particularly those which are to be used as a part of a teaching plan. First of all, there is no good excuse for presenting visual material which is incorrect or untrue in any respect. The impressions made by projected slides are so vivid and lasting that it is almost criminal to use a slide which is not absolutely true in its portrayal of any situation. This statement refers not to unreliability on the part of the person making the slides, but to the many situations in which a slide does not convey the correct impression. If the slide is supposed to be a typical illustration of life in any section, it should be a typical illustration rather than something out of the ordinary. A picture of a farm home in Kansas should be of a farm home of average type, rather than a picture of an extremely fine or exceedingly poor one. A slide which includes pictures of different objects of various sizes should show those objects in their proper relation as to size. The same should be true of color. In short the slide should be absolutely accurate in portraying that which is to be projected on the screen.

A second standard which should be observed is that of quality. The photographic quality of the slide itself should be of the very best. If the slide is tinted, the coloring should be expert and pleasing to the eye rather than splotchy or irregular.

The attractiveness of the slide itself will have much to do with the



teaching value. If it contains too much material, or not enough, or is poorly arranged, or is not clear in certain parts of the picture, the pupils will lose interest in it.

There should be a concentration of attention on the essential elements to be noted or illustrated with the slide. If a slide of a certain important building is to be shown, that building should occupy the center of the picture and the surrounding elements should be in the background. If an object in nature is to be presented in slide form, that object should be the central attraction of the slide itself, and the other objects which surround it should become secondary.

The mechanical make-up of the slide is very important. The mask which "frames" the picture should be placed accurately, giving the picture a smoothness and regularity which would not be the case if the mask is placed at an angle or is irregular in its border lines. In making slides it is much more satisfactory to purchase at small cost a set of masks which have been prepared with mechanical precision. This will give a uniformity to the slides which will be pleasing to the eye and will avoid distraction of the attention. The slides in any one set or group should be of exactly the same picture size, if it is possible to arrange them in that way.

**Preparing Collections of Glass Slides.** Those who are interested in making the most effective use of slides will find it advisable to accumulate gradually a collection of materials which will be particularly suitable for the courses in which they are to be used. One of the first elements to consider in arranging such a collection is the cost of the materials. Ordinary black and white photographic slides range in price from 35c to 75c each and tinted slides will range in price from 65c to \$2 each, depending largely upon the care required and exercised in the coloring. The cost of the materials themselves will make it advisable for the teacher to be very careful in the selection of materials to be added to a permanent collection. Of course, many of the slides in the collection will be teacher- or pupil-made and this form of slide is not expensive.

Perhaps the next consideration will be care in determining just which slides should be colored and which should be black and white. A simple rule to be applied in making this decision is to ask whether or not color will add materially to the value of the slide. If not, certainly there is no justification for the extra expense incurred in preparing or securing a tinted slide. There are many situations in which the color will add considerably in giving a true impression of

the object to be projected on the screen. In those cases, color should be used if possible. Some teachers who have become experienced with the tinting of slides have found it advisable to order uncolored positive prints and apply the appropriate tinting. The process is not difficult to one who is at all artistically inclined, but is one which requires a high degree of patience and care.

One of the paramount considerations in arranging a collection of slides, whether for individual or school use, is that of suitable filing or housing of materials. In all cases, slides or other visual aids should be so filed as to be accessible with the least amount of effort. The indexing system used, regardless of whether it may be alphabetical, by subject, or numerical, should be clear to all who make use of that set of materials. There should be a complete list of all slides available, and a copy of this list should be accessible to each teacher using the slides.

There are many convenient systems for filing slides so they will be readily accessible to the user. One of the most convenient forms is a large cabinet containing upright racks in which the slides are stood on edge and may be lifted in and out of the racks with ease. Furthermore, the slides are so arranged that the teacher may look through them without removing them from the case. These outfits are reasonably expensive but are worth the cost in those situations where they can be afforded. The usual plan of filing slides is to prepare small boxes or drawers approximately the dimensions of the slide in which the slides stand side by side. Filing outfits of this sort may be purchased or may be constructed in the carpenter shop or by the manual training class.

The proper care and repair of slides is essential to keeping the service in working order. Slides should be handled by holding the edges, and not by grasping the face of the slide with the hand. Each thumb or finger print on the surface of the slide itself will tend to reduce the brilliance of the slide and will be projected to the screen as evidence of carelessness. The surfaces of the slides should be washed whenever they become dirty through use, and the binding tape around the edges of the slides should be replaced whenever the corners become broken or frayed. The binding tape protects the inside of the slide from dust and moisture, so it should be in good condition at all times.

In some instances the cover glass will be broken in handling the slides. It is a very simple process to remove the broken glass and replace it with a new one. However, if the glass on which the picture is printed becomes broken, it is very difficult to repair it in such a way

that the crack will not show on the screen.

It is necessary in arranging for the distribution of slides among the various rooms or buildings in the school system to arrange some method which will be convenient and reliable. Usually the ordinary slide shipping cases are the best to use inasmuch as they may be subjected to rather rough handling without damaging the slides themselves. If a very cheap form of carrying case is desired, it may be made from heavy corrugated paper or of pressed fiberboard. These cheaper cases will require more careful handling but, unless the materials are to be sent long distances, there should be very little danger from damage or breakage.

**Prepared Assortments.** Keystone\* has prepared special collections or assortments of slides for use in various levels and subjects of instruction. One set is prepared especially for primary work and other sets are designed more particularly for the intermediate and upper grades. These sets contain some 150 to 600 slides, duplicate stereographs thoroughly cross-indexed, and a teacher's manual which contains helpful suggestions.

In addition to these very large and complete assortments, the Keystone Company provides selected groups of slides for special subjects in the fields of general science and geography. These are arranged in small sets of fifteen to twenty slides each, keeping the sets within the recommended size for ordinary school use. Other special sets of this nature are available from the various sources mentioned on page 217.

The large collection of miniature Kodachrome (natural color) slides, now offered to schools by S.V.E.,\*\* is not organized into specific units but many pictures from each of several fields are available for the selection of the most appropriate series for any given situation. It is possible to select slides which will have several applications in the teaching of various subjects.

**Projection Equipment.** A few years ago it was rather difficult to select suitable projection equipment for the use of glass slides. There were many projectors available which were offered at a wide range of prices. Each was supposed to be the best in its field, and the person interested in purchasing was left somewhat in a quandary by the various representations. At the present time, however, there are but three or four leading makes of projectors and any one of these instruments will give very good results in the average situation.

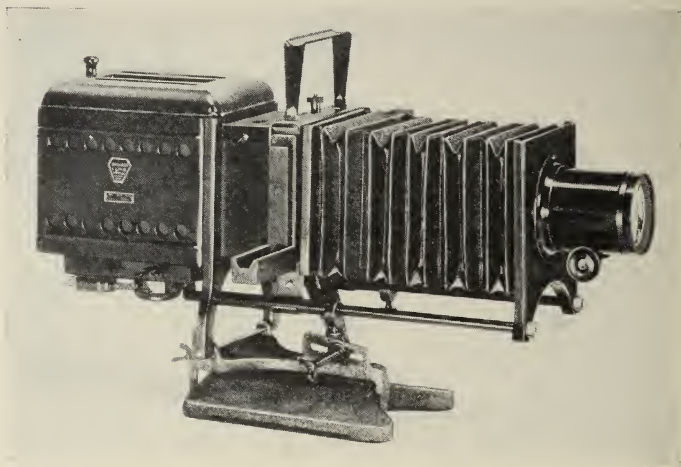
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\*Keystone View Company, Meadville, Pennsylvania.

\*\*Society for Visual Education, Inc., 100 East Ohio Street, Chicago, Illinois.

There have been many improvements making these classroom lanterns adaptable to various situations.

These improvements include stronger illumination, lens equipment



*Photo Courtesy Bausch & Lomb*

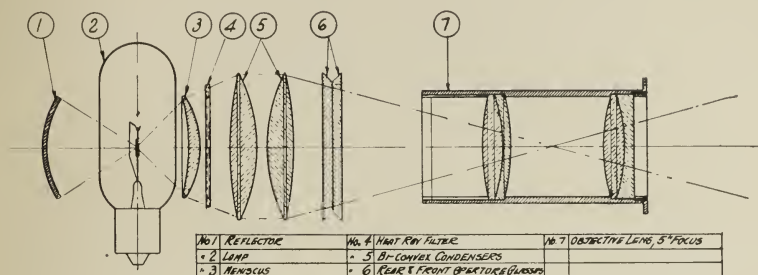
### **A Standard Glass Slide Projector**

of higher quality, adjustable bases for use when standing the lantern on an irregular surface, and readily accessible optical parts. It was formerly necessary to almost dismantle a lantern to change a lamp or clean the reflector and lenses. The modern lanterns are arranged with hinged lamp houses, so the entire optical system may be opened for inspection or for necessary care and adjustment by simply tilting the lamp house forward or backward. It was also necessary to exercise great care in replacing the lamp to be certain that the lamp was in perfect alignment with the optical system. The new projectors use pre-focused lamps, which may be changed by anyone, usually without making any adjustments whatever.

The average glass-slide lantern, complete with carrying case, costs approximately \$70. This includes the lamp which is in the projector, and it is usually advisable to secure an extra lamp at the time of purchase to be protected from embarrassment or delay when the original lamp burns out. These lamps will give 100 hours or more of projection service on the proper type of current, but an unusual jar or careless handling of the projector may cause a lamp to break or burn out at any time.



**Optical Parts of the Projector.** The optical parts of a film-slide projector are essentially the same as those of all projectors, still or motion. At the back of the projector there is a reflector to reflect forward many of the rays from the lamp which would be lost without it.



*Drawing Courtesy Society for Visual Education, Inc.*

### Typical Optical Arrangement in Film-slide Projector

Just ahead of the reflector is the lamp, which is the source of illumination for projection. The next unit is the condenser, which is usually composed of two or three lenses in a series. Its purpose is to concentrate the direct and reflected rays of the lamp on the slide or other object to be projected. The slide itself occupies a position in the slide rack or aperture of the projector which is just in front of the condenser lenses. The foremost part of the projector is the objective lens which is used to secure a clear image of the projected picture on the screen at any given distance. This must be moved forward and backward somewhat in accordance with the distance of the projector from the screen, and is mounted on a sliding rack to permit easy adjustment. On the majority of the projectors the space between the objective lens and aperture gate or slide rack is covered by black fabric or leather bellows. The bellows serves several purposes. It avoids the possibility of stray light hitting upon the screen, walls, or other parts of the room, and serves to prevent interference with the light rays themselves. Furthermore, it serves as a protector for the lens and aperture gate, by keeping out dust and other particles.

**Care and Operation of the Projector.** One of the greatest advantages of the glass-slide projector is that it may be operated by almost anyone. There are certain simple rules which must be observed in handling the instrument, and the best results will not be obtained if those are not observed. In the first place, all parts of the projection



equipment should be kept as clean as possible. Dust should be removed from the metal parts and from the leather bellows by using an ordinary dustcloth, and should be removed from the lenses by using a lens cleaning tissue or a lintless linen. A very satisfactory type of lens cleaner for these larger lenses is the soft tissue which is used for various purposes in the home. It is not desirable to wash the lenses unless they become rather thoroughly coated with dust or oil, and in that case a soft cloth moistened with benzine will clean the surface quickly.

Although the best projectors can be adapted to almost any situation and will operate with reasonably satisfactory results even in a lighted room, it is usually advisable to arrange a projection table or some other convenient support for the projector and to darken the room. Any manual training department can make a projection stand at very little cost, and can build into it a small drawer to be used for a dustcloth, lens cleaning tissues, an extra lamp, extension cord, and such other items as will be necessary in operating the projector regularly. If light is needed in order that students in a classroom can take notes while slides are being shown and discussed, it is advisable to pull down all the shades, to shut out the interfering daylight, and turn on the incandescent lamps in the room. The incandescent lamps of usual strength will not interfere with the projected picture nearly as much as light from one or two uncovered windows on a clear day. The most satisfactory plan for providing a working light in the classroom is to suspend reflector lamps below the eye level of pupils. One such lamp will provide adequate light for two to four pupils, and several lighted lamps in the room will not interfere with projection.

**Adjustment of the Projector.** The principal adjustment needed in operating the glass-slide projector is that which will adapt it to the projection distance in a given situation. This can be accomplished quite easily and should give no one difficulty. Other adjustments may be necessary at times to accommodate a sloping desk on which the projector is placed, or to take care of the elevation of the picture to the screen. This can be accomplished usually by loosening the small set-screw at the base of the projector, adjusting the projector, and tightening the screw again.

Sometimes it is necessary to adjust the lamp itself. The majority of the projectors have made provision for this. The lamp socket is mounted in a sliding support which is held in place by a small set-screw at the bottom of the lamp house. After the set-screw has been loosened, the entire lamp assembly may be moved forward or back-

ward in the lamp house as necessary. It should be adjusted to the point where the clearest image appears on the screen. Sometimes it is advisable to adjust the light against a small, white card as the variations can be noted here more quickly than on the screen. Usually the lamps are set at the proper place when the projector leaves the factory and it is not advisable to make any change. In the case of older projectors, which have been adjusted frequently, it may be necessary to move the lamp to the proper position.

**Selection of a Projector.\*** The selection of a glass-slide projector for any situation can be determined only by giving consideration to the situation. Projectors which would be entirely satisfactory in one room or building might not prove to be desirable in another. This does not mean that one make of projector has any great superiority over any of the others, but that the equipment itself should be selected with some degree of care. For example, if the rooms in a building for which the projector is to be purchased are extremely long and narrow, it is quite probable that a projector will be needed which has a lens of comparatively long focal length. If the room is short, a shorter lens will be needed in order to get a large enough picture to be clear to all in the room. In ordering a projector, therefore, it is necessary that the approximate distance from the projector to the screen be given, as well as the approximate size of the picture desired on the screen. It is then possible for the manufacturer or distributor to select the proper length of lens for that situation. The majority of the classroom projectors for  $3\frac{1}{4}'' \times 4''$  glass slides have become somewhat standardized in the use of 150- or 120-volt, 500-watt lamps, so it is hardly necessary to give any consideration to the illuminant.

If a lantern is desired for use in an extremely large auditorium, it will be necessary to secure one which has a lamp stronger than a 500-watt lamp, as well as an objective lens of extremely long focus. This increase of the illumination naturally increases the amount of the heat generated by the lamp and makes it necessary to use a protector for the slides. In some cases a motor-driven fan propels a current of fresh air past the slide during projection to protect it from excessive heat. In other cases a water cell is inserted between the condenser lens assembly and the slide for the same purpose.

Those who may be interested in securing a lecture lantern for personal use and may want to secure the most convenient equipment will find the overhead lantern to be highly satisfactory. With this lantern

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\*See list of manufacturers and distributors of glass-slide projectors, page 218.

it is possible for the teacher to operate it at the front of the room, thus facing the class and facing the slide although the image itself is projected over the head of the instructor against a screen at the



*Photo Courtesy Spencer Lens Co.*

#### A Lecture Table or "Overhead" Projector

front of the room. This outfit is not recommended ordinarily in those situations where portability is desired, for it is rather difficult to move the screen from place to place and suspend it at the proper angle for clearest projection. Many instructors in colleges and universities have found this lecture-table type of lantern to be especially satisfactory as it can be adapted to so many useful purposes. In some instances it can be used in medium-sized auditoriums for lecture demonstrations, thus avoiding the necessity of arranging a system of signals between the lecturer and the operator.

**Combination Equipment.** There are numerous combinations of projection equipment, some of which may prove to be desirable under the proper circumstances. For example, a standard glass-slide projector may be purchased at \$70; a filmslide attachment may be added

to this projector at a further cost of \$38.50; or a micro-slide attachment can be added to the objective lens of the projector at a cost of \$20. Thus it is possible to equip one projector for the use of glass slides, filmslides, and micro-slides. In most cases, however, it is not advisable to attach so many different things to the one projection unit. The use of the equipment is thus limited to one room at any one recitation period. If separate instruments were available, it would be possible to use them in two or more different parts of the building. Furthermore, the cost of a separate filmslide projector is approximately the same as the cost of a filmslide attachment for the glass-slide projector.

A similar combination of equipment can be assembled by adding these various attachments to a standard opaque projector. The opaque projector costs \$100 and a glass-slide attachment costs \$35 more. A filmslide attachment can be added for \$38.50 and the other attachments as mentioned above at the prices quoted. The same objection is raised to this elaborate combination; it is less portable and is restricted to the use of one type of service at one time. It may be desirable to have one or two special attachments for the glass-slide lantern, and the extent to which the equipment is to be used in one room would be the determining factor. If several teachers in a school building are planning to use projected visual aids of various kinds, there should be as many different projection units as possible rather than a combination outfit.

**Principles of Projection.** The above discussion has mentioned some of the principles which should be applied in the projection of pictures. There are certain factors which determine the size of the picture: the distance from the screen, and the focal length of the lens. There are other factors which determine the quality of projection: the strength of the illuminant, the quality of the equipment itself, and the interference of light. Daylight projection has been mentioned earlier in this discussion. Perhaps it is well to mention it again inasmuch as there are so many incorrect ideas concerning daylight projection. As a matter of fact, there is no such thing as a "daylight" projector. The projector of today is many times as efficient as those which were in common use fifteen to twenty years ago. It is true, also, that these more efficient instruments will give reasonably good results in situations where it would be impossible to secure even passably good pictures with the old types of projectors. This does not mean that daylight projection, or anything approaching it, is entirely satisfactory. It



does mean that in cases where outline slides are to be used or slides which have extreme contrasts of black and white, they may be used in rooms which have been darkened only partially. It means that in those cases where the school architect failed to provide suitable shades for darkening the room, a limited amount of projected materials may be used with varying degrees of success. The teacher or administrator who is interested in purchasing equipment should not be fooled, however, by the various representations of daylight projection either with glass-slide projectors, motion-picture projectors, or any other type of instrument which is expected to provide a clear image.

### *The Filmslide*

The filmslide, which has been in use for the past twenty years, is another type of projected still picture. It differs from glass slides as the pictures are printed in series on 35 mm. film. The film pictures, therefore, are reduced to about  $\frac{3}{4}$ " x 1", or 1" to  $1\frac{1}{2}$ " in size, and their cost, weight, and storage space are reduced correspondingly. Although the slides are in fixed series, a slight projector adjustment makes it possible to show the pictures in any order which may be desired. Also, the individual pictures may be cut apart and mounted between 2" x 2" cover glasses.

The filmslide is called by various names which should be mentioned here to avoid confusion. "Filmstrip" is a name used in some places. Here and there the nomenclature is reversed, and we may hear "slide-film" or "stripfilm." They are known to some as "film rolls," and as "stereopticon films." The trade name adopted for them by a leading producer is "Picturol," and "filmslide" is the name used by many of the educational producers; but these names all refer to the same convenient series of pictures, as illustrated here. Filmslides were introduced by the Society for Visual Education, Inc., in 1920. Their use has spread extensively, not only among schools and churches, but also in the industrial field, among CCC camps, and in many other Government agencies. Their place in defense training is highly important.

There are two common sizes of the filmslide: the single-frame slide and the double-frame slide. The single-frame slide, which is in more common use, was described partially in the first paragraph. The width of the picture is across the film, the top of the picture on each frame or "slide" being toward the head of the film, so the filmslide runs through the projector vertically. The double-frame slide is about  $1\frac{1}{2}$ " x 1" in size, but is printed on the same width of film—35 mm.—



so the width of the picture runs *along* the film, the top and bottom of the ordinary scene being toward the edge of the film, as illustrated page 86. This means that the double-frame film-slide ordinarily runs through the projector *horizontally*. An exception occurs whenever a vertical picture has been taken, as of a tree or high waterfall, by turning the camera vertically. This necessitates turning the aperture gate of the projector to a vertical position to present the image in proper position on the screen. This should not be done by the seemingly simple expedient of turning the projector on its side, as modern projection lamps are made to burn base down, and most of them will burn out more readily if placed in any other position. Thus a more versatile projector, a swivel-head type, is required for double-frame filmslides.

The rapid growth of the private use of miniature cameras with double-frame exposure on 35 mm. negative is bringing the double-frame filmslide into widespread use in presenting the visual phases of special projects. Also the very important work of the library associations in many parts of the world, in arranging for the making and exchange of miniature photographs (on film-slides) of the pages of rare books and manuscripts, promises to result in the production of enormous quantities of double-frame filmslides. (See page 96.)

An important variation of filmslide practice and production has already grown to useful proportions. We refer to the mounting and preservation of individual frames clipped from filmslides. This is done either between stiff cardboard masks or between miniature glass slides 2" x 2" square. Certain film-slide projectors\* are fitted with miniature slide carriers so these indivi-

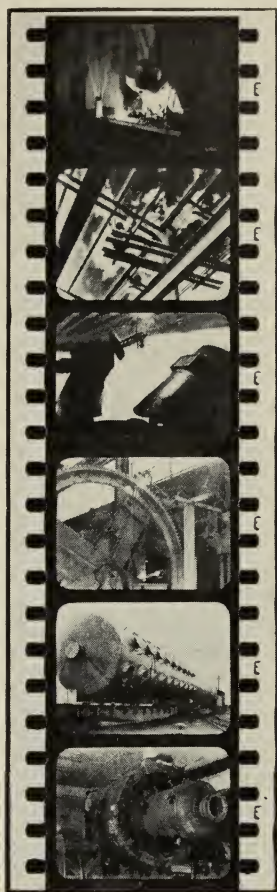


Photo Courtesy Society for  
Visual Education, Inc.  
Section of a 35 mm.  
Single-Frame Filmstrip  
(Actual Size)

\*Argus Models A and B; Eastman; Leica; S.V.E. Tri-Purpose Models AAA, DD, and CC; and S.V.E. Miniature Models AK, DK, and RK for 2"x2" slides only.

dual frames may be projected in any order desired. This practice grew out of the fact that amateur photographers in their educational projects frequently found only part of the pictures on any one roll of negative suitable for use. But it fits in exactly with the desire of



*Photo Courtesy Society for Visual Education, Inc.*

**Section of a 35 mm. Double-Frame Filmstrip (Actual Size)**

many instructors not to be limited by the fixed sequence of views in a filmslide.

While this individual treatment of filmslides is more expensive than the filmstrip method, it is being developed extensively by some instructors who are creating and accumulating transposable lecture materials for their local school or college needs. It is also definitely provided for, in addition to the filmstrip method, in the Eastman Kodak Company's service to Kodachrome (color film) users.

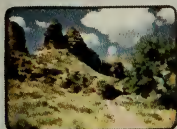
***Kodachrome Library***

The Kodachrome library recently announced by the Society for Visual Education makes available to schools as well as churches and other educational groups a very complete collection of miniature (2" x 2") slides designed primarily for use in educational work. This library, which consists of more than twelve thousand miniature slides on individual subjects, is a valuable contribution to the audio-visual field.

In this library there are slides covering many courses, ranging from social studies and national parks to sciences such as entomology, zoology, embryology, botany, and geology. All the slides have been selected very carefully and a low cost per unit has been established for the material.

As a visual aid, full, natural-color transparencies of this kind are invaluable. In many instances, color has been shown to have greater effectiveness in teaching than black-and-white pictures, so this new development meets a logical need in visual education.

# KODACHROMES



**National Parks**



**Ornithology**



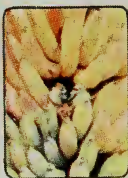
**Art**



**Patriotism**



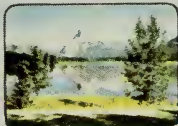
**Botany**



**Industries**



**Gardening**



**Geography**

The Kodachrome slide is the newest and already one of the most popular of visual aids. Miniature (2"x2") slides in natural color are now available for practically all courses of the usual school curriculum.





These color films, when they are mounted between glass, may be a lasting part of a school's slide library. There is no cost of upkeep and the slides, being very small, can be filed simply and easily in sturdy cases which are now available at low cost. Metal files for 1500 slides are available at prices from \$25 to \$35, while wood and leather-covered cases are lower in price.

Because most of the current miniature camera work done by individuals is in double-frame size, many of the double-frame projectors are equipped with slide carriers for the projection of individually mounted frames, although the frame itself may have been clipped from either a double or a single frame or bantam filmstrip. By using different masks, any of the three sizes can be mounted between 2" x 2" glass plates. These miniature mountings are commonly held together by binding the edge with  $\frac{3}{8}$ " Scotch tape, which adheres tightly without moistening, but which can be removed quite easily if desired, also without moistening. This is a very important point when using such small bits of film, one side of which is covered with emulsion which can be spoiled easily if permitted to become damp.

**Advantages.** The introduction of the film slide placed at the disposal of many schools, pictorial matter which had been too expensive or too limited in quantity to cover the needs of the average school. Glass slides were fine when they could be obtained; and, in the opinion of some, they still remain unequalled for brilliant projection. But schools which have had access only to a limited supply of glass slides and could not afford to purchase in that form more than a small portion of the materials needed for frequent use have found that film slides and miniature slides are highly satisfactory substitutes at considerably lower cost. In fact, when economy becomes essential, the filmstrip is the best answer, and is so improved as to rival standard glass-slide quality.

Several of the advantages of the film slide were presented by Mr. Bell in his discussion before the Fourth Annual Conference of Texas



*Photo Courtesy Society for  
Visual Education, Inc.*

**Slide Box for 100 2"x2" Slides**



School Administrators.\* "There are a number of different types of visual aids and each has its place in teaching, but of course, there is a great deal of overlapping in their usefulness. The particular visual aid that I am to discuss is the film slide, or as it is usually called, the 'Picturol.' The film slide is in reality a strip of 35 mm. motion-picture safety film with a series of different pictures printed on it. It has most



Slide Box for Filing 2"x2"  
Slides and Storage Cans for  
Film slides

*Photo Courtesy Society for  
Visual Education, Inc.*

of the advantages of any still picture. The projection machine is noiseless in operation and does not distract the pupil's attention from the picture; the projection machine is about the simplest of all types of machines to operate; the pictures cannot be got out of their correct order and there is no danger of breakage if they should be dropped. The film slide requires small storage space and is easily shipped from one school to the next. It is one of the most economical types of visual aids available. The showing of the film slide, as with other types of projected pictures, has the capacity of centering the attention of the class; each picture can remain on the screen as long as needed.

"Teachers, at times, make the mistake of using a motion picture when a still picture would be better. There is nothing that can replace the motion picture when you need to show motion, or when you need continuity of action; but why show a motion picture of such inanimate objects as Stone Mountain, the Grand Canyon, or the cliff dwellings of Mesa Verde? Do you not lose something of the feeling of stability of such inanimate objects when you see them in motion pictures?

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\*Bell, Walter S. From an address given before the Fourth Annual Conference of School Administrators, Austin, Texas, January, 1938. Reprinted in the *Visual Review*, 1938, pp. 13-15.

Please do not misunderstand me, I am not criticizing the motion picture as a visual aid. I think the motion picture is possibly the most valuable teaching aid that we have, when it is used for the purpose for which it was made, that is, to show motion. On the other hand, the still picture is a valuable teaching aid when it is used as intended."

The film slide is unusually economical to purchase. A complete roll of twenty-five to seventy-five pictures may be purchased at an average cost of two to five cents per picture. A roll of film slides weighs about one ounce, and is kept in a box or can so small that several will fit into the palm of one's hand. Also, the fact that the pictures are arranged in a carefully edited sequence on the strip of film appeals to many teachers of standard subjects in the curriculum; they do not always have the time or inclination to assemble individual slides from various sections of a cabinet and redistribute them properly after use. The projection equipment for use with film slides is inexpensive, simple to operate, and economical in weight and space.

There are many teachers who desire to prepare illustrative materials for projection in their classes. In most cases, these teachers have but limited funds with which to cover the cost of such materials. The film slide offers the least expensive photographic slide service. As explained later, small cameras are available to be used in taking pictures on 35 mm. negative. These cameras are simple to operate and are efficient. The pictures are just the right size to be used in the film slide projector, and may be produced easily at home, in school, or in the camera club. Thus, by the exercise of a little care and skill, excellent film slides can be made by a teacher who has access to a 35 mm. miniature camera. The entire cost of materials, developing, printing, etc., may be kept below an average of five cents per picture, ready for projection.

Many school administrators and supervisors, as well as instructors, have found such photographic apparatus to be very convenient for recording special teaching projects, situations where repairs and replacements are needed, photographs of pupils, and the like. At the appropriate time, these may be projected for group discussion and consideration. Teachers of vocational agriculture may photograph livestock and growing crops during the summer months when school is not in session, and use these pictures during the winter for class study. Some prepare photographs of special drawings and charts for projection before classes.

Because of these and possibly other advantages, the increase in the use of filmslides in less than two decades has placed in the schools of the United States more pictures in this form than there are reported



300-watt Miniature Slide  
Projector

*Photo Courtesy Society for  
Visual Education, Inc.*

to be glass slides after more than a half century of usage. There is more new educational visual material available in filmslide form at present than in any other. It is interesting to note that in recent years the demand on the United States Department of Agriculture for stereopticon pictures is now solely for filmslides, whereas as late as 1932 thousands of glass slides were requisitioned annually for loan.

Other Government agencies are using filmstrips for training purposes and have found these convenient small pictures to be unusually satisfactory.

**Limitations.** The principal earlier limitation of filmslides was chiefly the limitation of projection. It was difficult to obtain sufficient brilliance of projection without danger of damage to the film. The development and use of efficient heat-ray filters has dissipated this danger, without reducing materially the projection efficiency. The temperature at the aperture gate, which is important in the projection of all types of still pictures, has been reduced to the point where it is no longer a problem. This makes it possible to use 200- and 300-watt concentrated filament lamps for projection. With these, it is possible to secure projection results which are entirely satisfactory under all ordinary circumstances.

A minor limitation, already touched upon, is that the filmstrips are in a fixed sequence. This may or may not be a limitation, depending upon the resourcefulness of the instructor who wishes to use them. In many projectors, the filmslide can be run backward or forward to select desired pictures in different order or for a different purpose than for which the filmslide was designed. While showing the pictures in a filmslide in irregular order is possible, it is not as convenient as selecting the desired slides from among those of a set or series. As mentioned earlier, for those who insist upon such selection, the miniature glass slide, or the mounting of individual frames from filmslides between 2" x 2" glasses, provides the answer.

A few may feel that there are too many pictures in a filmslide for use during one school period. In fairness, however, it must be said that such a feeling seems to be a survival of the days when pictures meant entertainment. When pictures are used for instruction, the thoughtful instructor might very seldom use all, or even half of the pictures in a filmslide in one period; but often he will be glad that the filmslide carries an abundance of pictures from which he may choose.

**Production of Filmslides.** As mentioned above, it is rather easy to produce filmslides. The cameras for the single-frame size of 35 mm. pictures have practically disappeared from the American market. Filmslides with single-frame pictures, made from stock or for quantity distribution by the commercial producers, are photographed with adaptations of the more expensive motion-picture camera, or with especially built and laboratory-mounted automatic focus cameras costing hundreds of dollars. This apparatus is designed for quantity production of high quality and the production service is available to schools at moderate cost. It is only necessary to provide the illustrations and appropriate instructions concerning the sequence desired.

The majority of the 35 mm. cameras now available for use by individual enthusiasts are for double-frame pictures, the characteristics of which have been described above. There are several reliable makes.\* These range in price from \$10 upward. They are used for almost every purpose for which any type of camera would be useful. Experts and advanced amateurs select high-speed cameras, slow-speed cameras, special lenses, filters, etc., all at prices lower than the cost of comparable equipment for the production of larger negatives. The cost of operation is very much in favor of the miniature camera. Pictures may be produced at two to five cents each, whereas the average cost of

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\*Argus, Contax, Eastman, Exakta, Leica, and Welta.



standard camera photographs is about thirteen cents a picture. Further-



Photo Courtesy Eastman Kodak Company  
**Kodak Ektra—35 mm. Camera**

more, these little cameras are unusually satisfactory and economical for the production of photographs in natural color. These may be projected, duplicated, or enlarged with highly satisfactory results.

Quoting again from Bell\*:

"Many schools are finding that there is a real use for homemade filmstrips which can be made with the miniature camera.

"If a filmstrip is made of the school journey, or excursion, it will be very valuable in helping the children *recall correctly* the things they saw and did. This will make the journey doubly beneficial. Every school, I think, would like to have a record of the school activities. The homemade filmstrip is a practical answer to the problem of how this can be done.

"As the pictures of the school activities are shown from year to year, there will develop new ideas as to how the activities for a given year can be improved. The filmstrip of school activities can be used effectively to interpret the school program to the school patron and general public.

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\*Bell, Walter S. From an address given before the Fourth Annual Conference of School Administrators, Austin, Texas, January, 1938. Reprinted in the *Visual Review*, 1938, pp. 50-51.



"They can be used within the school system to show how the best teachers are solving their problems and in this way help the poorer teacher to do better work.

"At first, we would suggest that only outdoor pictures be made, then later, the school photographer will naturally want to try some indoor pictures.

"The inside pictures with the outside pictures will provide a complete record. Many senior high-school teachers and college teachers seem to feel that the lecture method of teaching is the method best suited for their work. A dry lecture can be made into an interesting lesson oftentimes by the simple expediency of using a film slide to illustrate what is being said."

These little 35 mm. cameras and film, producing negative exposures about  $1\frac{1}{2}$ " x 1", are used for everything that can be done with almost any other type of photographic equipment. The pictures are recorded *along* the film, rather than *across* it as on the single-frame film slide. The high quality of many of the negatives produced permits making enlargements to any desired size. By using an auxiliary lens, copies of photographs, drawings, manuscripts, or other flat materials may be made. The uses of the miniature cameras are almost unlimited, especially for those who desire to collect materials to be projected in classes or before other groups. As previously indicated, the positive film prints from this negative are film slides, and may be printed in sequence on filmstrips, or mounted between glass as individual slides.

If it should be desirable to have enlargements of some of the pictures which appear on the small film, such enlargements are comparatively easy to make, as low-priced equipment is available for the purpose. Some amateurs have attained great skill in making enlargements by projection of the negative image through inexpensive enlarging equipment. Or, one can have moderate-sized enlargements made by reliable photo-finishing laboratories at a cost of from six to twenty-five cents each. With the newer fine grain films, it is possible to secure results which permit enlargement of ten to fifteen times the dimensions of the negative.

The load, or roll of negative, used in the double-frame 35 mm. cameras is long enough for thirty-six exposures, and is commonly priced from seventy to eighty-five cents. Those who may be economical in their inclinations should purchase raw film in 400-foot rolls and load their cameras at a cost of about fifteen cents per roll of thirty-six exposures. The usual charge for developing the negative and print-

ing one positive copy for projection is \$1. This includes about thirty cents for developing, and about two cents per picture for printing. The appearance of semi-automatic selective printers in the market at popular prices will solve the printing problem for most amateur miniature camera and filmslide enthusiasts, especially if they have access to the facilities of a school laboratory or camera club darkroom.

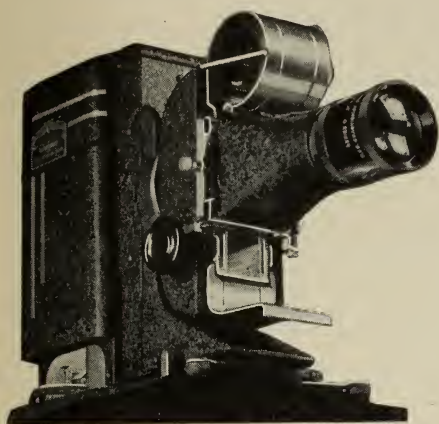
The most recent and delightful development in the production of filmslides is the natural-color film for the miniature camera. Unfortunately for those who would like more than one positive copy, this is a "processed" film; the beautiful, colored projection positive is made by "reversing" the negative itself. Where a number of similar or identical negatives can be made at the same time, the camera owner eventually has that many similar positives for use. The manufacturers of color film for use in miniature cameras now produce duplicate prints for projection or make enlargements in full color. The service charges now seem high, but there is every indication of much lower prices as these films are used more extensively. The price of the negative—\$2.50 for an eighteen-exposure roll—includes the processing, so the cost per picture, ready for projection, is about fourteen cents. This is far cheaper than hand-colored glass slides; cheaper, in fact, than the majority of black and white glass slides of standard size. (See list of manufacturers, pp. 217-222.)

**Projection of Filmslides.** Filmslides are usually shown in special projectors designed for the use of filmslides only. The filmslide projectors range in price from \$15 to \$57.50, including carrying case. It is usually desirable to purchase the best equipment the budget will permit. With these it is possible to keep one picture on the screen for any reasonable length of time without damage to the filmslide.

There are special attachments to the standard models of glass-slide projectors, for the protection of filmslides. They are almost as expensive as the separate filmslide projectors, and are not as efficient in protecting the film from heat. It is recommended that the school secure separate projectors for filmslides, so the glass-slide projector may be used at the same time—in a different room if desired—and so the more expensive 500-watt lamp of the glass-slide projector will not be used unnecessarily.

The filmslide projectors generally in use in school are the ones which accommodate only the single-frame slides. With the increase in local and individual use of miniature cameras, and the gradual growth of stock libraries of double-frame filmslides, it will be desirable in many places to secure projectors which accommodate both sizes. Some of

these projectors, known as Tri-Purpose projectors, also accommodate the miniature glass slides made from individual frames by camera enthusiasts who have discarded the poorer frames from their film-



300-watt Tri-Purpose Projector Equipped with Heat-Ray Filter

*Photo Courtesy Society for Visual Education, Inc.*

strips, or by instructors who are building a collection of selective lecture illustrations. Double-frame filmslide projectors do not exceed the others in price, as a rule; and the combination Tri-Purpose models just described are available from \$38.50 to \$65.00, complete with carrying case. A list of manufacturers of filmslide equipment may be found on page 218.

**Sources of Filmslides.** There are several producers of both stock and special filmslides, and some maintain large libraries of this material on thousands of subjects. The two largest such libraries in the United States were combined in the summer of 1936. There is a combined catalog compiled and published by the Society for Visual Education, Inc., Chicago, which lists the filmslide subjects of all the larger producers of filmslides for the general school field as well as subjects for use by churches, Boy Scouts, etc. There are many sources from which filmslides may be secured on loan or may be purchased. Several of the University Extension Divisions have full libraries of filmslides for loan to schools. Some industrial organizations from time to time arrange for the production and distribution of valuable filmslide sets among schools at little or no cost\*. The average strictly educational

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\*Free filmslide distribution to schools has usually been made through the Society for Visual Education, Inc., Chicago,

filmslides carried in stock by the producers and distributors range in price from \$1 to \$3, with the majority listed at \$2.

The United States Department of Agriculture, through its extension service, offers a very economical filmslide service to those who may be interested in material for use in teaching agriculture in its many phases. The department has prepared many sets from its vast library of photographs, and these special sets are listed in mimeographed catalogs and are priced generally from fifty to seventy-five cents a roll. It is not claimed that this low price represents the full cost of these special and often very valuable agricultural filmslide productions, as the Government absorbs the overhead, postage, and distribution costs. But it has enabled many schools offering vocational agriculture courses to purchase a considerable quantity of this material and establish filmslide libraries for permanent use, when they otherwise could not have done so. Other Government agencies have filmslides available and are glad to have them used among schools.

A list of sources of filmslides of various kinds will be found on page 218 of this book. The majority of the organizations listed have subjects available in various fields and will be pleased to send complete information upon request.

### *Microfilms*

"Microfilm" is the name generally applied to a very small photograph of a much larger printed page—check, annotated drawing, well log, or page of a book, magazine, or newspaper. This miniature photograph, on either 16 mm. or 35 mm. film, may then be enlarged through projection to a convenient reading size. Libraries use the process to copy rare books and manuscripts, thus saving the originals from dangerous handling. Banks use the process to copy and preserve records of checks and deposits. Other business houses use it to copy and preserve important documents. Hundreds of pages of valuable information may be recorded on a small roll of film and read or reproduced as desired.

Microfilming in recent years has developed to a point where the material is becoming available to small school libraries and where microfilms can be made quite easily by using compact, simple photographing equipment. The new microfilm readers have been designed to meet the demands of the small library as well as the larger reference library. In addition, they are especially suitable for use by business houses which microfilm their permanent records. The field of micro-



filming is a large one and, for those particularly interested in it, there are a number of excellent volumes and sources of information. The Union Library catalog of Philadelphia and the catalog of the Special Libraries Association at New York City are among the best.

Microfilms may be made on 16 mm. or 35 mm. film stock. In 35 mm. film, both perforated and nonperforated types are available. The perforated 35 mm. film is regular motion-picture stock. Nonperforated film has the same overall size, but the sprocket holes are omitted, thereby allowing additional space to be covered with the photographed material. Microfilming apparatus is available from such companies as Eastman, Folmer Graflex, and others.

A microfilm reader, which is manufactured by the Society for Visual Education\*, accommodates both perforated and nonperforated film. It will also accommodate 16 mm. microfilm, but it was not constructed for the express purpose of showing this size, and the magnification may not always be satisfactory. The magnification of the projector is from one to twelve. The unit has a 100-watt lamp, is easy to operate, and uses 100-foot reels. The film advancing and reversing mechanism is simple and efficient. The machine can be used in a fully lighted room because of its shadow-box arrangement over the reading surface. It is small, compact, and readily adaptable for use on a small table or an ordinary library desk or reading table.

### ***Three Dimensional Projection***

In the development of the use of films in education, it was first possible to have a projected image in black and white, and only in the past few years have we been able to obtain full natural-color projected images through the development of color film. Now, however, we are also able to have, in addition to color, the experience of *depth* in projected images. This is possible because of the introduction of a photographic and projection system for stereo films.

The stereo projection equipment is available in two designs—one for stereo filmstrips only and one for both filmstrips and stereo slides measuring 2" x 4¼". Stereo pictures consisting of two pictures of a single scene are mounted in pairs and are either placed between cover glasses measuring 2" x 4¼", or printed as pairs on 35 mm. filmstrips. The three dimensional effect is given through the use of Polaroid filters in the projector and the use of Polaroid viewers or spectacles by the

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\*Society for Visual Education, Inc., 100 East Ohio Street, Chicago, Illinois.



audience. The surface of the projection screen for three dimensional pictures is of a special metallic type, similar to the aluminum screen, and may be used equally well for other types of projection.

Since the experience of depth in images produced by the stereo projector is so lifelike and effective, it is expected that equipment of this kind will, in the future, be adopted by the more advanced schools. At the present time there is no adequate source of prepared filmstrips and slides to be used in this projector, but many of those desiring to have such effective teaching material are producing it inexpensively for their own slide libraries.

### *Slide Binders*

For the many schools developing their own miniature and stereo slide libraries, there are available binders of simple design which will protect films from damage due to mishandling. Kodachrome emulsion is, of course, subject to scratches, abrasions, and fingerprinting; and dust over the surface of these color films will detract from their excellence in the projected image. Kodachrome film should, therefore, be mounted in one of the efficient mountings which are now available for single and double frame, bantam, and stereo films.

Standard binders are available for both the bantam and double frame sizes; for the mounting of single-frame film there is a special mat which is designed to fit inside of the the double-frame binder, which reduces the aperture to single-frame size. The binders are reasonably priced and will keep the Kodachrome film cooler during projection. These binders are very light in weight; exceptionally easy to use in the mounting of film. The film is held tightly between glass, thus eliminating warping and the annoyance of refocusing

### *The Silent Motion Picture*

**History of the Motion Picture.** The thing we call a motion picture, which is not a picture of motion at all, has been in existence for countless ages. That is, the principle of the motion picture has been known to mankind for three or four thousand years. Historical records indicate that in ancient China there were devices which produced the effect of motion perceptible to the eye. One of these devices has been explained as being a dark box in one end of which was a small peephole and in the other end a hole about three inches square. Some enterprising Chinese with artistic ability had painted similar

pictures in sequence on a strip of silk approximately three inches in width, and this strip of silk was pulled past the large opening by one person while another placed one eye at the small hole to see these marvelous pictures of action. It was a far cry from those early attempts to produce the illusion of motion to the development of the motion-picture film which is used so extensively for education and entertainment today. However, the ancient and the new depend upon the same psychological phenomenon for the illusion.

Psychologists tell us that an image on the retina of the eye remains there approximately one-twelfth of a second after the object itself may disappear from view. This is known as "persistence of vision." If we can arrange, therefore, to remove one picture and substitute another similar picture within the period during which vision persists, we can view the pictures with a feeling of continuity just as we do the motion picture today. The pictures are changed on the screen at the rate of sixteen times per second when silent films are used, and at the rate of twenty-four times per second when sound pictures are used. The result is a smooth continuity of the series of still pictures placed so closely together that the eye travels from one to the next without noticing the break or change. The ordinary motion-picture reel, therefore, is made up of a series of 16,000 separate and distinct still pictures which are closely related, and are projected on the screen within a period of from ten to fifteen minutes.

One of the first attempts at producing motion pictures was made by Leland Stanford late in the nineteenth century. He was interested in determining whether or not a certain horse actually raised all four feet from the ground at any time while it was traveling around the race track. Motion-picture cameras had not yet been invented, so several still cameras were placed side by side around a sector of the race track and separate pictures were photographed as the horse passed these points. The experiment was successful in answering the question, but a young engineer by the name of Isaacs was given the task of devising an apparatus which would produce a continuous record of the action of the horse. To him is credited much of the early development of the process for recording motion pictures. It was not until the last few years of the nineteenth century that pictures were produced which were even passably satisfactory for education or recreational use. It is interesting to find that the motion-picture apparatus invented by Edison was perfected for the purpose of recording and projecting pictures to be shown in conjunction with phonograph records—pictures of the recording artists.

The first moving pictures presented to the public were offered in doorway recreation spots such as the penny arcades of today, and created quite a stir among those who would drop a penny in the slot to see John L. Sullivan strike a few times at an opponent. As the popularity of this magical device increased, an apparatus was perfected which permitted the pictures to be projected across a room against a reflecting screen. There were no picture "palaces," and the only amusement places large enough to permit a crowd to gather were rather small. In some cases it was necessary to borrow chairs from the nearest undertaking parlor to accommodate those who desired to be seated comfortably during the brief period required to run through the entire show—usually about ten minutes.

In one of the early discussions of motion pictures, the story is told of a group which had gathered in one of the small picture houses to see motion pictures of ocean waves coming in to the shore. The pictures were so realistic that those who were seated in the front rows actually bolted, causing damage to the furniture and to others present.

Since those early days the motion picture has grown to the point where it is generally accredited with being as powerful as the press in its influence upon the life of the American people. The first Western pictures were produced way out "west" in West Orange, New Jersey. Pictures today are produced with settings in every part of the world, and some of the highly imaginative ones with settings of other worlds. There seems to be almost no limit to the possibilities of the motion picture in presenting life of all types in every part of the universe.

**Use of Motion Pictures in Education.** Although Edison's early dream was the utilization of the motion picture for educational purposes, motion pictures strayed far from that purpose before they again returned to the educational field. The first intensive application of the motion picture to educational procedure was immediately before and during the first World War, largely for propaganda purposes. Motion pictures were found to be so valuable during that period, that the close of the war brought into existence many types of educational films and film producers. Henry Ford launched a production program covering large numbers of pictures for educational use, many of which were the best available at that time. The large industrial organizations had found motion pictures to be especially helpful within the organization, and began preparing pictures which could be used to educate the public with respect to the functions and products of those organizations. Educational film producers sprang up in various parts of

the country. The majority of those producers did not seek or receive the counsel of educational authorities, so many of the films produced were of little or no value in the school. The first use of the motion picture in schools was largely for the purpose of entertaining the student body.

The period of enthusiasm for the application of motion pictures to the instructional field, from 1914 until about 1920, was followed by a decided slump. Those who had purchased elaborate projection equipment, largely upon the representation of enthusiastic salesmen that unlimited quantities of highly educational films would be available at little or no cost, found that the supply of films was not as extensive as had been represented; that many of the so-called educational subjects were not increasing pupil achievement to any measurable extent.

During the early period of enthusiastic use of educational pictures and the period of the slump which followed, certain experimental psychologists and educators had given attention to the possible uses and values of the motion picture in educational procedure. Experiments were conducted in various parts of the country by such pioneers in the field as Weber, Freeman, Johnson, Roach, McClusky, and others. It was found that there were certain definite values to be expected from the proper use of the motion picture, and these findings were instrumental in causing larger and more stable organizations to undertake the production of strictly educational films.

One of the first creditable moves in this direction was made by the Society for Visual Education, with its science and geography films. The next major project was started by the Yale University Press when it began the production of the *Chronicles of America Photoplays*. These pictures are among the finest historical subjects ever produced, and are used extensively by schools throughout the United States. The Yale production program was followed closely with the announcement of the Eastman Teaching Films to be produced and distributed by a subsidiary of the Eastman Kodak Company, an organization which had gained its financial strength through the development of the motion picture. Other producers came into the field, particularly those who were interested in producing industrial films of an educational nature—films which would give a true story of the various industries and their products to interested groups.

The development of the educational picture in the United States was paralleled to a certain extent by similar development in the European countries. Although the United States is the leading producer of mo-



tion pictures of all kinds today, there are many other nations which are applying the motion picture to educational problems in a very effective manner. It is rather safe to state that motion pictures are being used for educational purposes in every civilized country as well as in many countries or localities which may not have achieved that rating. American produced pictures, both educational and recreational, have had their titles translated into many different languages and have been distributed throughout the world.

The schools of the United States are using motion pictures extensively, and probably more schools in this country than in any other are equipped to utilize the service. There are very few of the first class cities in the United States which do not have centralized departments or bureaus of visual instruction charged with the responsibility of providing visual aids to the various teachers in their respective school systems. Those cities offer very complete service to their teachers and have co-ordinated effective visual aids with the curricula so as to get the best possible results. Of the forty-eight states there are more than thirty which have one or more agencies for the distribution of motion pictures among the public and private schools. The various departments of the Federal Government have taken an active part in the promotion of visual instruction or in its direction during the past several years, and are now giving increased attention to this rapidly developing educational field. The Office of Education at Washington has established a clearinghouse service for the assistance of those who come to it for suggestions or for information as to where certain materials may be obtained. The Departments of Agriculture, Commerce, and the Interior have utilized motion pictures extensively in connection with their work. There are many excellent subjects available for loan to schools practically free of charge, which cover the leading developments in the fields of agriculture, forestry, mineral industries, women in industry, and other industrial activities in this country. The Department of Labor has produced several motion pictures dealing with its activities and for the purpose of promoting a more intelligent regulation of industries.

**Advantages and Limitations of Silent Motion Pictures.** There are several situations in which the motion picture will serve better than any other type of projected visual aid. With the motion-picture camera, one can slow down the action of an athlete for form study; or take pictures of any other rapidly moving object, even at the speed of a rifle bullet. It is possible, therefore, to study thoroughly the action of objects which would be much too rapid for the unaided eye



to analyze.

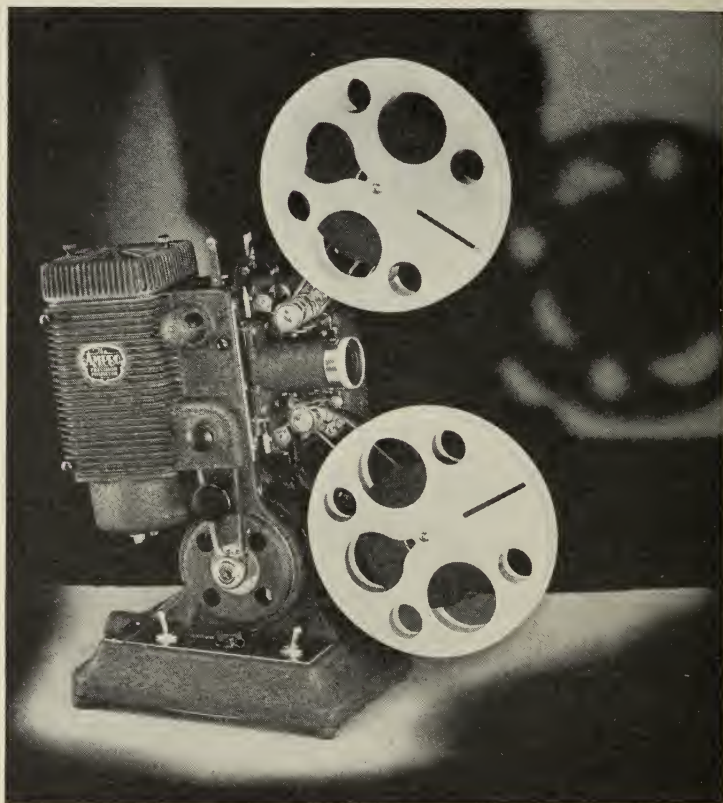
The same device may be used to speed up action to the point where a normal life cycle of a plant, for example, can be presented on the screen in a minute or less—action which would be much too slow to be perceived by the eye. Similarly, it may be used to stop the motion of a moving object at any desired point for study. And by use of the animated drawing, it can bring before any group clear representation of action which would be invisible to the unaided eye. A steam turbine, for example, appears to be just a huge metal case in which something is happening to turn it as steam passes through it. Watching it might give the pupil all sorts of misconceptions. But a simple, animated drawing of what happens inside the turbine may present this action in a manner which will be intelligible to all.

The motion-picture camera, with the aid of the microscope, can be used to record and reproduce the normal action of life forms much too small to be seen by the unaided eye. Furthermore, these animalcules in action may be projected to a screen, greatly enlarged, for concentrated group study—a thing which cannot be accomplished in any way except through micro-projection. By this same process, the eye of a fly may be made as large as a balloon; the head of an ant may be enlarged to fill a space six or eight feet in diameter; the blood stream in a capillary can be enlarged to the size of a small brook; and a Paramecium can be made as large in appearance as a small boat.

The motion picture may be used to present animated diagrams or statistical data in such a way that they will form an indelible impression upon the audience. It may be used to provide a brief survey of broad topics. With the various tricks of motion-picture photography, it may be used to clarify impressions concerning almost any situation where motion is necessary to convey the message correctly. It can bring all parts of the world to the classroom. It can present in normal motion the many life forms which could not be brought to the classroom and to which it would be difficult or impossible to take classes or other groups for direct study or observation. It is the nearest approach to reality in studying objects in motion and, in some cases, proves to be more effective.

It would be unfair to pay all these glowing compliments to the motion picture without calling attention to some of its shortcomings. The motion picture, at best, is but a substitute for the actual experience. If it is possible to study life forms in their natural surroundings, the school journey should be utilized instead of the motion picture. Furthermore, the motion picture should be employed only in those

situations where motion is necessary to give the correct impression. A motion picture of an inanimate object is not as satisfactory as is a good slide, photograph, specimen, or model of that object.



*Photo Courtesy Ampro Corporation*

### **16 mm. Silent Motion-Picture Projector**

The motion-picture projector is a rather simple combination of gears and gadgets, but some teachers encounter difficulty in operating it. A reasonable amount of mechanical aptitude is required to be able to take proper care of the projector. There is much danger of damage to the film if the projector is not cleaned, oiled, and operated properly. The projection of motion pictures requires a more thorough darkening of the room than would be necessary for the projection of glass slides. The cost of the equipment and of the service is greater than the cost of

still-picture projection equipment and service. All these limitations but serve to emphasize the importance of using the motion picture only in those situations where motion is required.

It is well, in considering the comparative values of motion and still pictures, to call attention to some of the advantages and limitations set forth by McClusky.\*

### **Advantages:**

1. The moving picture has the unique advantage of depicting action or behavior, with its irresistible illusion of life and reality. It is, however, an expensive visual aid and for that reason should be resorted to only when necessary (1) to show activity, which no other pictorial aid can actually portray, and (2) to provide such vicarious experiences as may be brought to us because we cannot get them in any other way.

2. The film has proved valuable to scientific workers by enabling them to reproduce processes and analyze motion and movements for detailed study.

3. The film has value in presenting popular nontechnical phases of the subject to those who have relatively little knowledge regarding it.

4. By means of the motion picture and the animated diagram, one can visualize the invisible.

5. The motion picture is very effective in publicity, drives, campaigns for social betterment and similar forms of propaganda.

6. The film is the best visual tool when the continuity of a process involving movement is to be seen.

7. The film is advantageous for purposes of vivid summary or general survey of a broad topic.

8. The film is unique in revealing, for the first time in the history of human learning, things which move too slowly or too rapidly to be seen by the human eye.

### **Limitations:**

1. The film, with its rapid-fire method of projection sometimes must be shown a second or a third time if any real study and analysis of the content is to be achieved.

2. Some moving pictures have a tendency to relegate the teacher to the background.

3. Continuity is definitely established. This may not fit the teaching plans, but is not a serious problem to the teacher who is trained to use

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\*McClusky, F. D., et al., "The Place of Visual Instruction in the Modern School." (Syllabus of a proposed text.)

motion pictures effectively.

4. Films are perishable and do not stand wear and tear like some other visual aids.

5. The film, to be effective in the classroom, should be previewed by the teacher and followed up by definite study. Sometimes the teacher cannot get the film when it is needed most.

6. The film is used too often as a substitute for, rather than a supplement to, other methods of presentation.

**How to Use Silent Motion Pictures.** The field of discussion opened by the heading for this section would provide ample material for many pages of discussion. It shall be the aim here, therefore, to point out a few of the general rules to be observed in getting the best results from motion pictures under normal conditions. Special conditions will require variations.

1. The motion picture should be used where it will contribute most to the understanding of the subject; i.e., to introduce the subject, as a part of the laboratory or study period, or as review.

2. The picture should be used directly in connection with the teaching of the subject to which it pertains; i.e., the motion picture "Dixie" should be used during the week or weeks devoted to consideration of the War Between the States.

3. The teacher should preview the film in order that there may be thorough familiarity with the content. Points which are not entirely clear to the teacher should be checked in advance, so questions from members of the classes may be answered intelligently.

4. The showing of the film should, in most cases, follow an oral introduction or discussion, during which certain unanswered questions will be left for the film to answer.

5. In the case of silent films, explanatory discussion during the showing has been found to be helpful in some instances if the discussion is pertinent. If not, omit it.

6. Usually, it will be advisable to show the film twice; once with minimum comment, followed by open discussion, and the second showing to answer questions raised during the intervening discussion.

7. Use the film reverse and stop-on-film sparingly or not at all. Reversing and stopping the film, unless accomplished properly, may become merely a funny stunt, thus losing its potential value in analysis of motion. Furthermore there is a strong possibility of damage to the film.

8. Whenever possible, use the pictures with but one class group at a time, and use them in the room to which the class is accustomed.



Moving the class to another room, or with another class or section, is likely to become little more than a picture show, except in situations where a skillful auditorium teacher is in charge.

9. Follow the use of the pictures with an adequate test or other checking device, to determine the progress made. This procedure will have a tendency to develop among class members the seriousness of purpose of the picture presentations.

10. Make certain that the film and equipment are forwarded to the next teacher or school according to schedule. Report any difficulties in projection, such as breaking the film, irregularities in projection, etc., to the person in charge of the visual instruction service for the building or school system.

11. Plan for the next picture well in advance, relating it as closely as possible to the topic with which it is to assist.

**Types of Film.** There are two types of film in general use, one of which is used almost exclusively in the theatrical field, and the other almost exclusively in the field of education. One is nitro-cellulose or inflammable film, and the other is cellulose acetate or "safety" film. The theatrical motion pictures are mainly printed on nitrocellulose film. This film is inflammable and requires extreme care in handling. It is a little more durable than "safety" film and costs a little less. Theaters are equipped with fireproof projection rooms and also fire-prevention gadgets of various kinds, so there is no great hazard encountered in using this film in theaters. It is more economical and is used for practically all theatrical productions.

The other type of film is made of acetate of cellulose and is the slow-burning or noninflammable film, known as "safety" film. Inasmuch as the majority of the schools which use motion pictures do not find it convenient to project them from a booth or projection room, the "safety" film is much more desirable for use. All 16 mm. motion pictures which are released for educational service are printed on "safety" film. The majority of the 35 mm. silent and sound pictures which are available for schools are on "safety" film also. Schools which use 35 mm. motion pictures in portable projectors should make certain that the films are of the "safety" type, for there is a great hazard in using the inflammable films outside of suitable projection rooms. In some states and in many cities the use of nitrate films, except in accordance with very strict regulations, is a punishable offense.

The use of the 16 mm. "safety" film in all the usual 16 mm. motion-picture projectors does not affect fire regulations of the state or city and does not affect the insurance rating on the building in which the



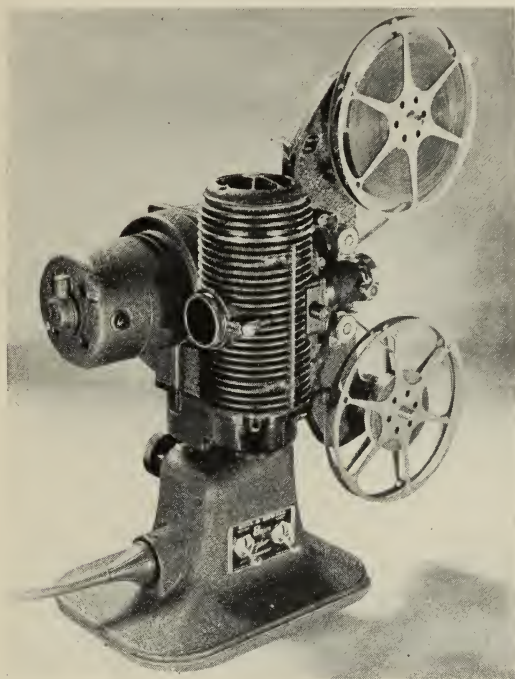
pictures are projected. There may be a few freakish situations which are not in accordance with the general rule but, if so, there is certainly no justification for such a freak ruling. The "safety" film will burn if subjected to continuous flame or heat of an intense nature, but certainly will not burn to the extent that there would be any danger of fire from it during projection.

**Sizes of Film in General Use.** The history of the motion picture has recorded many different sizes of film ranging all the way from 8 mm. film to 70 mm. film, or approximately  $2\frac{3}{4}$  inches in width. There have been films 8, 9.5, 12, 16, 28, 35, 50, and 70 mm. in width. Many of these have disappeared from general use largely due to the fact that standardization has been centered upon the 16 mm. film for non-theatrical use and the 35 mm. film for theatrical purposes.

The recently developed 8 mm. motion-picture film which has become so popular for amateur use, offers some interesting possibilities to those schools which desire to experiment with film production. Teachers who wish to prepare motion pictures to illustrate certain lessons in their courses will find this small film, used in a good projector, to be both inexpensive and satisfactory for small groups. Furthermore, it may be used to produce natural-color films, also at low cost. There is no extensive library of 8 mm. educational films available at present, but several producers of educational and travel films are now offering 8 mm. prints at low cost. Those who plan to use this size of film will find it extremely important to secure cameras and projectors of highest quality, as these instruments must be both accurate and dependable if satisfactory results are to be achieved.

The 16 mm. motion pictures, which have become the educational standard for classroom and ordinary auditorium use, were first developed as an answer to the problem of a cheaper way in which to produce sales-promotion films or films to be used within industrial organizations. The early types of projection equipment did not give the best results, and many who witnessed 16 mm. motion-picture demonstrations seventeen or eighteen years ago were not impressed by their possible use in schools. Since that time, however, more powerful projectors have been built and the 16 mm. motion-picture film can be projected in the average classroom just as satisfactorily as the 35 mm. film. As a matter of fact, some of the 16 mm. motion-picture projectors now available are capable of giving better projection in the classroom than the majority of the portable 35 mm. silent projectors.

There are many advantages of the 16 mm. motion picture for educational purposes. In the first place, it is much cheaper than the film of 35 mm. size, in purchase price and in the cost of transportation.



*Photo Courtesy Bell & Howell Co.*

#### **8 mm. Motion-Picture Projector**

The fact that it is safety film means that it can be shipped by ordinary parcel post or express in small paper cartons at one-quarter or one-third the cost of shipping a comparable reel of 35 mm. motion-picture film.

Another great advantage of the 16 mm. film is the ease with which it may be handled. It is light in weight and may be easily carried from place to place. Furthermore, the projection equipment for the use of this film has been simplified to the extent that any teacher with but a few minutes of instruction will be able to operate it successfully. It is certainly much easier to operate than some of the older classroom projectors for 35 mm. films. In addition to the simplicity of operation which characterizes the 16 mm. motion-picture projector, this pro-

jector is extremely light in weight and may be carried from one room or building to another even by a pupil in the intermediate grades. Another advantage is that it may be attached to any standard house-lighting circuit without causing undue strain upon the wiring. The average circuit protected with a 10 ampere fuse will be sufficient to operate any of the 16 mm. silent projectors.

For some years, all educational sound pictures were either 35 mm. sound on film or 16 mm. film with sound recorded on a disc. There was a feeling for a few years that it would be impractical to record sound on 16 mm. film. The chief difficulty was that of finding a place on the film for the sound track. This problem was solved by omitting the sprocket holes on one side of the film. It has been found entirely satisfactory to use film which has the sprockets on one side only, as the better makes of 16 mm. sound motion-picture projectors are built with such accuracy that very little pull is required at the aperture gate to move the film from one frame to the next.

Another problem confronting those who developed the 16 mm. sound film was that of reducing the sound track from its original length of 1000 feet on 35 mm. negative to the new and shorter length of 400 feet on 16 mm. positive. This reduction has been accomplished optically with marked success and the recording and reproducing range on 16 mm. film now approximates that of the ordinary 35 mm. sound films. Some of the new types of sound recording such as the mirrophonic process used by Western Electric and the ultra-violet higher fidelity process used by RCA actually increase the range far beyond that which has been accomplished by reduction to 16 mm. film. On the other hand, first-class 16 mm. reductions cover the range of normal sounds in a thoroughly satisfactory manner. In many cases the person with an ear untrained to notice minute sound variations will be unable to detect whether the sound comes from 16 mm. or 35 mm. film.

As a result of perfecting 16 mm. sound films and projection apparatus, the 16 mm. sound film is taking the place of the 35 mm. film for educational purposes, except in those situations where it is desirable to use theatrical films for combined educational and recreational purposes. This situation is changing inasmuch as some of the theatrical producers are now reducing their best films to 16 mm. for use among schools. It is expected this change will become more general, thus gradually eliminating the use of 35 mm. equipment among schools except where it is necessary to project pictures longer distances and to greater size than can be accomplished satisfactorily with 16 mm. film and projection equipment. Many schools are using both types of

equipment in order that they may make use of all available worthwhile films.

The 35 mm. motion picture, which is the standard theatrical size and which is a little more than twice the width of 16 mm. film is being used less and less among schools and other educational organizations for the projection of silent pictures. The ratio of silent 35 mm. usage to the use of silent 16 mm. films seems to be about one to fifteen, based on the distribution of films of both sizes by such agencies as the Y.M.C.A. Motion Picture Bureau, the U. S. Bureau of Mines, and other large nontheatrical distributors of silent films. It is interesting to note in this connection that the ratio of silent motion-picture projectors of both sizes to sound motion-picture projectors in use among schools is approximately four to one, although this ratio is changing in favor of the sound projector from year to year. Practically all 16 mm. sound motion-picture projectors are so constructed that they will project both silent and sound films. This means that those projectors must be equipped to operate at two speeds. Sound films move through the projector at the rate of twenty-four frames per second, requiring approximately eleven minutes for the projection of one full reel of 400 feet. Silent films move through the projector at the rate of sixteen frames per second, requiring approximately fifteen minutes for the projection of one full reel.

The sound-on-disc equipment for motion pictures, which was used formerly by theaters and by schools, is no longer used by either one. It became obsolete among theaters some years ago and has disappeared from the school field. In fact, there are no distributors of motion pictures who offer sound-on-disc subjects.

**Problems in the Use of the Motion Picture.** There are some problems to be given consideration in connection with the use of the motion picture. The majority of these are minor rather than major, but are extremely important. First of all, those who are using motion pictures or who are planning to use them should become thoroughly familiar with the available projection equipment. An operator who does not understand the care and operation of equipment is likely to cause damage to the film. This will be charged to the person causing that damage inasmuch as it would be unfair to expect the owner of the film to assume it.

In the earlier days of the educational motion picture, certain scenes were little more than a series of stills on motion-picture film. With such films it was desirable to have a device to permit the operator to



stop at a certain frame and to hold that picture on the screen for discussion. It was later found that there was little justification for using motion-picture film except where motion was essential in telling the story, so these "still" shots have been omitted. This desirable change in film-producing techniques has eliminated the need for a stop-on-film device except in those instances where homemade movies may still contain scenes which are too short to permit thorough understanding of the subject. There is no prominent producer of teaching films today who advocates the use of a stop-on-film or a reverse mechanism in presenting films.

Another problem which will need to be given consideration is that of the cost of film, either for outright purchase or on loan, and the transportation of that film from the source of supply to the school. A few years ago it was necessary for schools in certain sections of the United States to send long distances for the films they desired to use. Since the inauguration of new service bureaus in various sections, nearly any school in the United States can now secure service within a distance of a few hundred miles.

The physical equipment of the building or rooms in which the motion pictures are to be used will need to be given some attention. The majority of the older buildings and some of the new ones are not equipped with floor plugs or electrical outlets to accommodate projection equipment. This is excusable in the older buildings, but no building which has been constructed within the last ten years should be without suitable outlets. If such a condition exists, it is advisable to have a competent electrician install outlets which are in easy reach of those who operate the equipment. All the physical equipment incidental to projection should be made as convenient as possible in order to avoid the creation of an artificial teaching situation in the room each time the equipment is set up for use.

The arrangement of the equipment within the classroom itself and the seating within the room will be important in the showing of motion pictures or other projected material. The best projection results are secured in long, narrow rooms as those students who are seated at wide angles from the screen do not get a clear impression of the projected image. The room should be darkened as thoroughly as possible, as any interfering light will tend to detract from the value of the picture itself. It is true that some of the more powerful projectors can be used in rooms which are reasonably well lighted, but there is likely to be a strain on the eyes of the pupils watching the picture, and it is quite probable the picture itself will not be as distinct as required. If it is



impossible to darken the various rooms of the building in such a way that each will be reasonably satisfactory for projection, it would be better to simply devote one room to projection purposes, darkening it as thoroughly as possible.

The projection equipment, including the screen and such other accessories as may be needed, will require a certain amount of care. It is hardly necessary to state that unless there is a fixed responsibility for a certain piece of equipment which is used by many people, the equipment will soon become useless to all. If the school unit or system is not large enough to have a visual-instruction department which will take care of the physical equipment, it is advisable to appoint some competent member of the staff to handle it and release that person from certain other duties to compensate for the time required. If this does not seem desirable, undoubtedly there are one or two advanced students in the school who are mechanically inclined and who would be pleased with the opportunity to become responsible for the care and operation of a projector. It has been found that students of this type are more thorough in caring for the equipment than members of the teaching staff who may have other duties to perform.

There are some schools that have organized a training program for projectionists which not only trains high-school pupils in a useful vocation, but also provides well-trained operators for showings within the school. Assignment for training and the actual handling of projection can be made during activity and study periods so as not to interfere with participation in class discussion. Sometimes a high scholastic standing is a requisite to assignment as a projectionist in training or in actual service.

**Evaluation of the Motion-Picture Film.** There are certain matters which should be considered carefully before plans are made to use a motion picture in connection with the instructional program. It is well to ask first whether or not motion is necessary to present the message. Certainly a motion picture of the Capitol Building in Washington, D. C., would present no advantage over a projected still picture of the same building, unless there is some action in the picture which is important. A good plain or colored glass slide of the building would be much more satisfactory, would be easier on the eyes of the pupils, and could be left on the screen as long as it might be needed for discussion purposes. Motion is desirable, of course, in any situation where the recording of natural motion or animation is needed to give a clear impression of the topic under discussion. A simple rule to follow, therefore, is to use motion only where motion is necessary.

Another simple rule which is becoming more and more important to visual-instruction workers is that the film should not be used unless it makes a definite contribution to the teaching of the subject. If a film on cattle raising on the Great Plains of the United States is to be shown to a class in geography or in agriculture, it should be used in connection with the study of cattle raising by the group. The film used at the proper time will be extremely valuable, whereas the improper use of it might be a total waste of time. There are many films posing as educational subjects which should never enter a classroom. In some cases the information contained in them is irrelevant and in others, it is incorrect. There is never a logical excuse for bringing into any classroom a visual aid which is untruthful or incorrect in any way.

As suggested above, there are many so-called educational films but a more limited quantity of films which are truly educational in their makeup. There are many subjects which are semi-educational and many of these can be applied at the proper time and place with reasonably good results. Also, there are many industrial films which have certain educational values. The films of the mineral industries produced by the U. S. Bureau of Mines; the films of various industries, such as those produced by the General Electric Company; the films of the agricultural industry produced by the U. S. Department of Agriculture; and similar educational subjects produced by smaller organizations throughout the United States can be used to good advantage if they are selected carefully and presented properly. Too many times the schools which use industrial films simply order them for any available date and attempt to make use of them when they arrive. This is just as unsatisfactory a procedure as it would be to use other educational films when they do not fit into the schedule.

### ***16 mm. Silent Motion Pictures***

**Advantages and Limitations.** The preceding discussion has mentioned some of the advantages and a few of the limitations of the 16 mm. silent film. Economy is one of the greatest advantages, and limited size and distance of projection is the greatest disadvantage of the 16 mm. film. However, the limitations of size and distance might be considered an advantage inasmuch as they have in some instances forced the educational motion picture into the classroom, where it really belongs. The discussion which follows will call attention to some of the favorable and unfavorable aspects of 16 mm. film.

**Cost of Materials.** The cost of the 16 mm. silent motion-picture

film is very reasonable. The best educational subjects in existence can be purchased at an average cost of approximately \$25 per reel. (See list of sources, page 211.) There are some highly specialized subjects with limited distribution which are more expensive, and there are many subjects available for less. However, it is advisable in most cases to select films from a reliable and reputable producer inasmuch as the variation in cost is too slight to run the risk of getting materials which are not of the highest quality.

The majority of the service bureaus which offer to lend visual aids to schools have individual or group service fees which will provide standard 400-foot reels of 16 mm. silent films at an average cost of approximately \$1 plus transportation charges. In most cases this means that any school may secure the use of a 400-foot reel of the best educational motion pictures for one full day by paying a service fee of \$1 plus the normal transportation and insurance charges. In a few instances this fee is less and in some instances it is more. Industrial and scenic films are available without charge when ordered directly from the industries which produce them, and there is usually a small service fee charged by the visual-instruction bureaus which have accumulated assortments of industrial films. In most cases the nominal charge made by the service bureaus will be less than the postal charges for delivering the films from the producers and returning them. It is usually advisable, therefore, to secure the film service from the nearest service bureau. The service fees are reasonable and the materials themselves are usually of high quality.

Those who may be interested in producing their own motion-picture subjects will find that the costs vary somewhat in accordance with the difficulty of securing good pictures of the subjects included. It is comparatively inexpensive to photograph any subject which is normally to be found in good light out of doors. It may prove to be rather difficult and expensive to produce films which require the use of artificial lighting, animation, or other special devices to record the picture properly. More attention will be given to film production later in this book.

**Transportation Charges.** One of the greatest advantages of the 16 mm. motion picture is the extremely low cost of transportation. A reel of 16 mm. film may be shipped entirely across the continent at a cost of about fifteen or twenty cents. It would cost three or four times as much to ship a reel of 35 mm. motion-picture film. If the films are to be shipped long distances, there will be very little dif-

ference between the costs of parcel post and express. Both postal and express employees are usually ready to co-operate to the fullest extent in providing the best of service, and express shipments require no additional insurance. Also, return express shipments are accepted at half rate.

**Current Developments.** It is interesting to notice that there are now many excellent 16 mm. motion-picture subjects available for school use, and that the majority of the silent films in production are being planned for film of 16 mm. size. It is but seldom that a 35 mm. silent motion-picture subject is announced in current publications, whereas new 16 mm. silent subjects appear in each issue of the leading magazines in the field.

**Convenience.** The majority of the conveniences of the 16 mm. motion picture have been suggested earlier. The two great conveniences of this type of film are the ease of handling and the ease of projection. There are two factors which contribute liberally, the light weight of both films and equipment and the simplicity of operation of the projection equipment.

**16 mm. Silent Motion-Picture Projection Equipment.** One of the great advantages of the 16 mm. motion picture is the ease and economy with which it may be projected. The majority of the projectors available for use in schools are extremely simple to operate, require a minimum of attention, and are readily portable. Furthermore, the best types of projectors will give projection results which compare favorably with those secured by the use of 35 mm. film-projection equipment.

There will be no attempt, in this publication, to classify the various projectors available. All the leading projectors offered for sale have certain points of favor and certain limitations. These projectors range in price from \$75 to \$180, depending largely upon the completeness of the instrument, quality of lenses, size of lamp, and the like. There are many small projectors available, ranging in price from \$3.98 to \$50.00, but the majority of the projectors which sell at a price below \$60.00 are merely toys and should not be purchased for school use. In addition to their limitation in projection ability, quite often they are poorly constructed and will have a tendency to damage the film during projection.

**Selection of Equipment.** Those who may be considering the purchase of 16 mm. motion-picture projection equipment will do well to



give careful consideration to each of the various makes available. It is true that each manufacturer is proud of his product and sees in it all the advantages possible to incorporate in one instrument, but there are reasons for the differences in mechanical construction and price and those reasons can be discovered, in most instances, by comparison.

Some consideration should be given to the type of room in which the projector is to be used most frequently. In the majority of cases it is advisable to use educational films in the classrooms. If this is not possible, the next best plan is to equip one room for projection and reserve it for that purpose, taking classes to it when required. In such cases—in the special room or in a classroom which can be well darkened—almost any of the standard makes of projectors will be entirely satisfactory. If the equipment is to be used in a very large room or auditorium, or in a classroom which cannot be satisfactorily darkened, it will be necessary to select one of the more powerful, 750-watt projectors with high quality optical equipment.

All distributors and sales organizations are ready and willing to arrange for demonstrations, if they are assured of the sincerity of purpose of those requesting such service. The firms or individuals who arrange for demonstrations of equipment are performing a real service for those interested in the demonstration; it is expensive to travel from place to place and expensive to purchase and maintain equipment for demonstration purposes. In fairness to local firms or traveling representatives, therefore, it is urged that requests for demonstrations be withheld until there is an active interest in the purchase of equipment. It is decidedly unfair to ask any individual or organization to ship or bring expensive equipment and materials to any school or other organization merely to add variety to an otherwise dull P.T.A. or other community program. Schools which request such service should be willing to pay at least the expenses of the demonstration if equipment is not purchased soon after.

Some representatives travel throughout the country looking for business and will offer to demonstrate while in the school's vicinity. In such cases, those interested in demonstrations should permit them to do so and should consider themselves under no obligation to purchase or to pay travel expenses. Frequently, such demonstrations will arouse an active interest in the use of the equipment and materials.

Those who desire descriptive material concerning projection equipment of various kinds should contact an agency which represents a manufacturer, or write directly to the manufacturer. (See list on page 220.) The manufacturers will provide the information promptly and



will refer the request to a local representative, who will arrange for a demonstration.

**Accessory Equipment.** There are certain accessories which should be secured at the time of the purchase of the projector. First of all, no salesman should be careless enough to permit a school to purchase a projector without an extra lamp. Projection lamps will give thirty to fifty hours, or more, of satisfactory service if handled carefully and connected to the proper current. It is possible to break a lamp instantly; and if another lamp is not available, there may be several days' delay in securing one. An extra lamp is an absolute necessity and should be on hand at all times.

Additional equipment which should be on hand includes a film patching and rewinding outfit, a dustcloth, a bottle of projector oil, an extension cord, a small bottle of benzine, and a projection screen of suitable size and type. The names of companies which have such equipment available will be found on pages 219 to 221 and a discussion of the various types of screens is given on pages 124 to 128.

**Care of the Film.** The first essential in caring for the film is to see that the projection equipment is clean and properly adjusted; carelessness in handling the projector can cause damage to the film. The film should be run through the projector at normal speed, and such gadgets as the stop-on-film and reverse devices, which are provided on some silent projectors, should be used sparingly, or not at all. If motion is necessary to convey the message, the picture should be shown in motion and not as a combination of motion and still pictures. There are very few instances where the still projection of a motion-picture frame is advisable; in those instances the still projection should be as brief as possible to prevent damage to the film through drying or warping. In fact, there are many visual-instruction supervisors who object to any use of these devices, and film producers seldom recommend their use.

The film should be handled carefully at all times. It should be removed from the shipping can with care, and properly threaded into the projector. After it is used, it should not be rewound except for repeat showings and should be kept in the shipping can when not in use. Dust damages film quickly; therefore, precautions should be taken to protect the film.

Breaks in the film should not be repaired by amateurs, and borrowed film should be repaired only if the film is to be shown again. If repairs are made, they should be made carefully, and directly in accordance

with the instructions provided with repair outfits. Careless repairs, or repairs made without the use of proper equipment and cement, may cause several feet of film to be damaged the next time the film is projected. Broken film should never be pinned, as there is danger of injuring the hands of inspectors or damaging the rewind mechanism.

Films should be kept away from extreme heat and should not be stored in rooms that are too warm. The 16 mm. film is not readily combustible, but abnormal warmth will cause it to dry and become too brittle for satisfactory projection. A cool, moist place is best for storing film.

After films have been used, they should be returned to the original containers, repacked carefully. If they are to be shipped through the mail, they should be insured at full value (about \$25 per reel). The package should be addressed clearly, with information as to its contents.

### ***Producing 16 mm. Educational Films***

Some instructors in vocational agriculture have found it advisable to prepare motion pictures of summer farm activities for use during the winter, when such activities cannot be observed. Some natural-science instructors have found it advisable to construct films of local bird and animal life. Athletic coaches have often found it advisable to produce films of outstanding athletes and teams, to be used in form study and in advertising athletic activities of the school. Colleges and private institutions have found the motion picture to be a valuable advertising medium, and some are also producing educational films of great value.

The motion-picture project of the American Council on Education has co-operated with numerous schools in the production of motion pictures. It has been the belief of those concerned with the project that the motivation and training provided through the problems of production fully justifies the nominal cost per pupil engaged in the project. The majority of these films pertain to many types of activities of the school and community. These films have also helped to develop desirable contacts between local business and community officials. Complete reports of these film-producing activities may be obtained from the American Council on Education, 744 Jackson Place, N. W., Washington, D. C.

**Selecting the Subject.** One of the first questions to ask is whether or not motion is necessary. If not, a good slide might serve the purpose better. Next, ascertain whether such a subject has been pro-

duced. If the subject has been produced somewhere else, professionally, it would be better and cheaper to purchase a print of that subject. The next problem is to determine whether or not the various scenes required for the production are accessible to the camera. The subject should have a real purpose and that purpose should be defined clearly before production is started.

**Preparation of Outline or Scenario.** A plan of production is essential. Film will be wasted if scenes are shot without relation to the plan of the picture, and additional time will be required to fit these random shots into the production. After selecting the subject, therefore, the next step is that of outlining, definitely, the content of the picture. Scenes should be selected in view of their relation to the purpose of the production.

The scenario for a motion picture, like the outline for a magazine story, should be directed at a specific audience. If the film is to tell a story to a scientific group, the film language should be thoroughly scientific. If it is intended for a juvenile group, care should be exercised to keep the point of the story within the understanding of juveniles. Once the required scenes have been determined, these should be arranged in logical sequence, and the script considered as a whole. If it is then found to be satisfactory, the plan can be turned over to the photographer for the shooting of the picture.

**Selecting a Suitable Camera.** The choice of a camera for this type of production will be determined by the material to be produced. If all the material planned is to be photographed in normal action, almost any of the inexpensive motion-picture cameras will be satisfactory. As variations become necessary, the need for care in selecting the equipment is increased. If slow-motion pictures are contemplated, a camera with variable speeds is essential. If nature-study subjects are to be photographed at long range, lenses of different focal lengths will be needed. If interior pictures are to be taken, it may be necessary to use lenses with greater speed than ordinary lenses, and sometimes wide-angle lenses will be required.

Good cameras range in price from \$60 upward, with the average all-purpose camera ranging in price from \$150 to \$400 with a fair assortment of lenses and accessories. The firms which are listed on page 221 are producers of 16 mm. motion-picture cameras and can offer suggestions as to most desirable equipment for specific requirements. As with the projectors, it will be well to give comparative attention to selection.

**Selecting Film Stock.** The selection of film should be given some consideration. The ordinary negative stock should be used for pictures of which several prints will be required. The majority of amateur producers, however, will not need additional prints and will find the reversible film to be more economical. Prints can be made from the reversible film, and the process is reasonably satisfactory. The reversible film, as the name suggests, is converted from negative to positive in the processing and comes back to the producer ready for projection.

The reversible film is divided into three principal classifications: orthochromatic, panchromatic, and super-sensitive panchromatic. The first is being replaced by "Verichrome" and "Plenachrome" film, which are satisfactory for all general purposes. The panchromatic film is used extensively for pictures where reasonably good light is available for the exposure. The super-sensitive film should be used in poor light or for pictures taken in artificial light, as it is much more sensitive to artificial light than is either regular or panchromatic film.

There are natural-color films available which add much to the value of those subjects in which color is important. The color films are a little more expensive than films for photographing in black and white and may not be duplicated as easily. The proper projection of color film requires stronger illumination than is necessary for projecting ordinary film, but the new projectors which permit the use of high-intensity lamps project color well, even in large rooms. It is seldom desirable to combine ordinary and color film in the same subject. If color is used in the same film with black and white scenes, the black and white sequence should make up the first part of the film and the picture should end in color. If the color is inserted between scenes in black and white, the change from color to black and white will be unsatisfactory.

**Shooting the Picture.** After the scenario has been arranged and the equipment and film selected, the important task is that of taking the scenes to be included. There are a few simple rules to be followed which will be of assistance to the amateur, and these are mentioned below. Experience is a dear teacher and those who operate the camera without first giving attention to certain simple suggestions may find that very expensive film stock has been wasted.

1. Use a reliable exposure meter to determine the proper lens setting. This cannot be overemphasized and such a meter should be used for each situation. Light values are difficult to guess, even for the professional.



2. Keep the lenses immaculately clean. The least bit of dust or oil on the surfaces of the lenses will have a tendency to destroy the true picture. A lintless linen cloth or a piece of lens cleaning tissue will be satisfactory for cleaning.

3. Keep the camera clean and well oiled. The accurately machined parts of the mechanism must have ordinary care in cleaning and oiling if the best results are to be obtained. Follow the instruction book which is furnished with each camera.

4. Hold the camera steady at all times. This can be accomplished only by using a sturdy tripod, which is almost as necessary as a camera if good pictures are to result. It is almost impossible to hold any motion-picture camera steady in the hands and it should not be attempted except in extreme cases where it is impossible to use a tripod.

5. Make complete scenes, not bits. A simple rule to follow is to count slowly to ten for any scene, increasing the length of the scene as may be needed to complete the picture of the action to be recorded. Short exposures are unsatisfactory and will waste film.

6. Shoot action shots at an angle. Pictures of rapid action should be photographed at an angle of approximately 30 degrees, with the action moving toward the camera. Pictures taken at right angles or directly behind or in front of the action are usually unsatisfactory.

7. Use filters whenever possible. A filter will tend to give a truer recording of color gradations and smoothness of detail.

8. Do not "pan" the camera. It is best to set the camera in a stationary manner and let the action move through the field of the lens. Turning the camera from one point to another while the picture is being taken, except at very high shutter speeds, will produce a jerky result.

9. Use half-speed or slow-motion variations only when necessary. If it is desirable to slow down the action of the subject, pictures may be taken at thirty-two or sixty-four frames per second. Football pictures seem to be best at thirty-two frames per second, as normal action is too rapid for a careful study of the plays. Half-speed pictures have but a minor place in the usual film, except for variety.

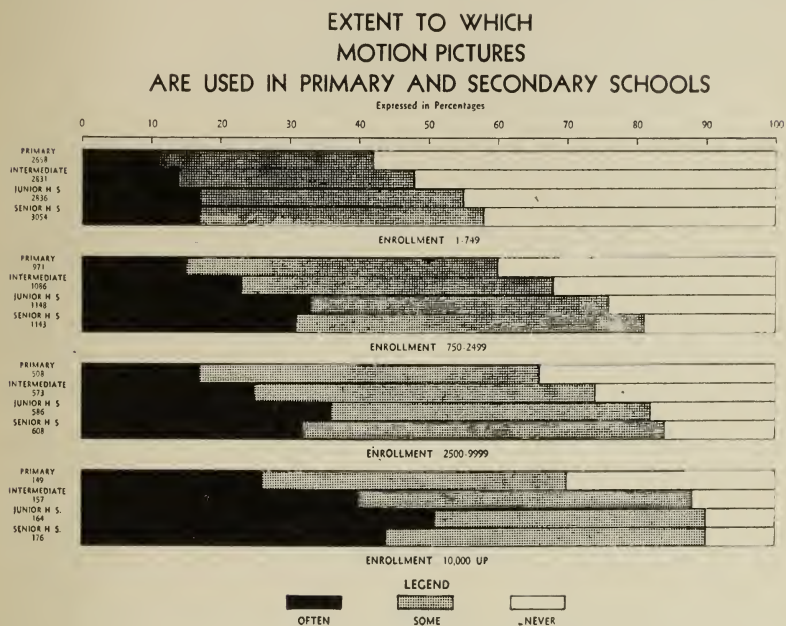
**Editing the Film.** After the films have been exposed and processed, it will be necessary to "edit" them. The scenes will be joined together without titles and it will be necessary to insert proper explanatory titles ahead of each scene. The following suggestions may be of assistance:

1. Cut out inferior scenes. If some of the exposures have not been entirely satisfactory, throw them away and retake them, rather than



spoil a good film by leaving them in.

2. Use attractive titles. Cheap and irregular titles will spoil an otherwise satisfactory subject. Titles can be made by amateurs, but



*Graph Courtesy Office of Education (1936 Survey)*

it is usually more satisfactory to have them prepared by an experienced title maker. Furthermore, a good title maker is able to make suggestions as to the most attractive way of arranging the titles. There are several organizations which prepare the titles at the usual commercial rates—25c to 45c for ten words or less—and assist with the editing at a nominal additional charge.

3. Splice the film carefully. Good splices are essential if the film is to operate smoothly in the projector. Follow the instructions with any good splicing outfit.

4. Do not show the film to an audience until edited. The desired effect of many amateur productions has been jeopardized by showing the pictures before they have been titled and edited. An unedited picture is almost certain to leave a poor impression.

5. If the picture is to be used extensively, have a "dupe" negative prepared from which additional prints may be made, and save the original. If the film is not to be used more than forty or fifty times, the duplicate print will not be necessary.

### ***35 mm. Silent Motion Pictures***

Very little attention has been given to 35 mm. silent motion pictures in this book inasmuch as films of that type are being used less and less among schools. The 16 mm. motion-picture films and equipment have replaced the 35 mm. silent films in the majority of the schools, and there are few instances in which 35 mm. silent subjects are being produced. Those who may be interested in using 35 mm. motion-picture service for any special purpose will be able to secure used films and equipment at very reasonable rates, but will find that the transportation charges on 35 mm. films are extremely high in comparison with the cost of shipping 16 mm. silent subjects. Furthermore, the quantity of good 35 mm. silent educational subjects is so limited that the average school will not be able to get what it wants on that size and type of film.

### ***Screens for School Use***

Satisfactory projection of pictures of all types requires, first of all, a screen with a reflecting surface suitable for the situation. There are many different types of screens available with trade names of every description. There is a rather general misconception of screens, as there has been of projectors, in that some screens are called "daylight"; there is no screen which will give entirely satisfactory service when outside light is interfering to any great degree. There are some screens which have higher reflective qualities than others, and the purpose of the following discussion will be to call attention to some of the advantages and limitations of these various types.

There are two general types of screens: (1) those which reflect the picture, and (2) those which transmit the picture. The first type is called the opaque screen and the second, the translucent. The reflecting or opaque screen is used most generally by schools and other educational organizations, although the translucent screen is used in some instances where it is advisable to have both the projector and the screen at the front of the classroom and it is necessary to compete with interfering light.

In the case of the opaque screen, the projector is usually placed toward the back of the classroom with the screen hanging in the front of the room. The required distance from the screen to the projector will be determined by the size of the screen and the focal length of the lens used.\* Ordinarily the classroom screen is from 3x4 feet in size to 6x8 feet in size, and any screen within the limitations of those dimensions will be reasonably satisfactory. Too large a screen should not be used as it will have a tendency to tire the eyes of those who may be obliged to sit close to it. At the same time, the screen should be large enough to provide a clear picture when viewed from the back of the room. One of the rules of long standing among theaters is that the width of the screen should be approximately one-fifth the distance from the screen to the person in the audience farthest away from it. In other words, if a screen is being selected for use in classrooms approximately twenty-five feet from front to back, a screen five feet wide would be desirable.



*Photo Courtesy Society for Visual Education, Inc.*

#### **Tripod Projection Screen**

**Beaded Screens.** The beaded screens which have been developed within the past few years, and which are used extensively in schools, are similar to other screens except that the surface is covered with small glass beads. This type of screen has the highest direct reflective qualities of the three general types—beaded, silver, and mat-white—but the picture when viewed from various angles in the room is not entirely satisfactory. If a beaded screen is to be used at one end of a long narrow room it will be entirely satisfactory. On the other hand, if it is to be used on one side of a short or square room, those who are seated at wide angles from it will receive a poor reflection of the picture. Tests which have been conducted by the Electrical Testing Laboratories in New York City indicate that the beaded screen gives

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\*Screen image tables for single and double frame filmstrips, 16 mm. motion pictures, and lantern slides will be found on pages 226 and 227.

the brightest picture for all angles up to 12 degrees; the silver screen is satisfactory at angles up to 30 degrees; and the mat-white surface should be used where there will be angles greater than 30 degrees. In most cases the angle of reflection will not be greater than 30 degrees so either the silver screen or the mat-white will prove to be satisfactory. The chief claim for superiority on the part of the beaded screen is its brilliance of reflection through a rather narrow angle.

**Silver Screens.** Silver screens, as mentioned above, have a metallic coating. These screens are flexible and will permit rolling without damage to the surface. The angle of reflection from the silver screen is greater than the angle of reflection from the glass-beaded screen, but has certain limitations. First, unless the screen hangs perfectly straight without the slightest wave on its surface, it distorts projected pictures, which does not occur with either white or beaded screens. Second, silver screens are commonly referred to as being color selective, since some of the finer coloring is lost when projected upon them. Silver screens are, therefore, becoming less popular since colored film is gaining in popularity.

**Polaroid Screens.** These screens are similar in appearance to silver screens, but the surface has been designed so as not to depolarize the projected light. This is essential in the projection of Polaroid three-dimensional pictures, recently developed by the Polaroid Research Laboratory in conjunction with the Society for Visual Education, Inc. Three-dimensional pictures are described briefly on page 97.

**White Screens.** It has been found that a screen which has a white surface does not provide the brilliant reflection one would secure from either the beaded screen or the silver screen, but the reflection at an angle of from 30 to 60 degrees is brighter than from the beaded screen, making this type of screen unusually satisfactory for the classroom which is approximately square in shape. Many who project glass slides and filmstrips prefer this type of screen and base this preference upon their feeling that the surface which is not so highly reflective is less tiring to the eyes of pupils. Furthermore, the projection of colored film is more accurate in reproduction when the white-surfaced screen is used. Some of these screens are made with a rubberized surface and may be washed with ordinary soap and water.

When choosing a screen it should be remembered that while its reflective properties are paramount, there are other important considerations, such as quality, cost, and probable life, which should receive careful attention.



**Translucent Screens.** The translucent screens, as mentioned above, are screens which transmit the light from the projector to the audience. The projector stands behind the screen and projects through it. There are some advantages to this type of screen and several disadvantages. It is used ordinarily for the projection of opaque materials where it becomes advisable to have both the projector and the screen at the front of the room. Some have arranged a dark box for projection by covering the space between the screen and the projector with a dark cloth supported by two or three small rods. This keeps interfering light from the back of the screen and provides projection possibilities in a well-lighted room, which could not be accomplished otherwise. However, if it becomes necessary to use such a screen temporarily, it will be less expensive to construct the screen than to buy it. The chief requirements are a frame of the proper size and enough architect's tracing cloth to cover that frame. The frame can be made by any manual-training department or carpenter shop, and the cloth can be purchased at a bookstore or architect's supply house. A screen approximately 3 x 4 feet in size can be constructed at a total cost of from \$3 to \$5, whereas the same screen of the special types prepared for the commercial field would cost \$15.

When translucent screens are used, short focal-length lenses of good quality are usually required and this adds to the cost of projection equipment.

If a translucent screen is to be used regularly and the best possible results are desired, a screen which has been built for the purpose should be purchased. The newer types of prepared translucent-screen materials are superior to the tracing cloth which is recommended for temporary use.

**Auditorium Screens.** The preceding discussions of screens have dealt entirely with screens for classroom use. The general principles of reflection should be applied in selecting a screen for a school auditorium. A much larger screen will be needed for satisfactory results in the auditorium and, in most cases, it will be desirable to purchase a screen which has been perforated for sound. The sound screen is very much the same as an ordinary screen except that it has been perforated with small holes through which the sound from the loudspeakers will pass when sound pictures are being projected. The perforated screens cost approximately the same as the ordinary screens and the small perforations will not affect the brightness of the picture

to any great extent. These screens range in price from 40c to \$1.25 per square foot, including a permanent mounting or shade roller. If the screen is to be extremely large, it will be better to have it mounted on a frame than on a roller. The rolled screens have a tendency to become frayed at the edges and wrinkled after some years of service.

**Types of Screen Mountings.** Screens may be secured on tripods, in boxes on solid frames, on covered or uncovered rollers to be hung against the wall, or on rollers to be suspended from the ceiling. A selection of the type of mounting should be determined by the situation in which the screen is to be used. If there is a railing above the blackboard in the classroom in which two small hooks or nails may be easily placed, these can be used to suspend one of the screens mounted on an ordinary shade roller either covered or uncovered. However, it will be necessary to have these nails or hooks placed in each room where the screen is to be used, so if it is not convenient to make such a provision, it will be better to purchase a screen on a tripod which can be easily adjusted. Any of the companies listed on page 221 will be pleased to send complete descriptive materials and prices concerning all types of screens. These screens range in price from approximately \$10 upward, depending upon the size of the screen, the quality of the screen surface, and the type of mounting selected.

### III

## Types of Sound Aids for Schools

THE discussions which follow will give brief consideration to the various types of sound aids which are being used extensively among schools, omitting from this section those aids which are composed of synchronized sound and pictures—still or motion. The next section will discuss those aids which depend upon synchronization of sound and pictures for their effectiveness.

In general, sound aids have followed the development procedure of pictures. They have been invented and developed as an aid to industry, or as an entertainment feature. Later, when found to have educational value, they were adapted to the instructional functions of the school. The phonograph record and the silent motion picture were developed about the same time for the entertainment of individuals. The first attempts at synchronization included the basic principles of each. The radio program, which entertained the family at the fireside, was found to have unlimited possibilities in the educational field, and schools of today are making extensive use of the most effective radio programs.

### *The Phonograph Record*

The desire to record sound so it might be preserved and reproduced is an ancient one. From Egypt comes the first corroborated account of vocal sounds issuing from a thing without life, more than 1500 years before the beginning of the Christian era. An ancient Chinese book of 2000 years ago contains a story of a curious box into which a Chinese prince was supposed to have spoken a message which he sent by a trusty messenger to his friend. When the friend opened the box, so the legend states, he could actually hear the words which had been spoken into it.

In more recent years, the history of science records scattered references to various attempts at recording and reproducing sound by mechanical means. The first authentic recording of the human voice was accomplished in 1857 by Leon Scott, a French scientist. The instrument was called the Scott Phonautograph. It traced a laterally undulating line on a cylinder which had been coated with lampblack, but there was no provision for reproducing the sound.

In 1877, Thomas A. Edison invented his famous tinfoil machine.

The record was a heavy metal cylinder, wrapped in a sheet of tinfoil. The recorder included a diaphragm and a stylus. Sound vibrations caused the stylus to indent the tinfoil as the coated cylinder revolved past it. The reproducer was similar to the recorder, but much more sensitive. The results were poor and indistinct. The machine was cumbersome and impractical, but was of scientific interest and opened the door for further development of sound recording.

About 1882, Dr. Alexander Graham Bell, Sumner Tainter, and Chichester A. Bell developed a process of recording on a wax cylinder. The recording was of the hill-and-dale type. They also developed a reproducing machine which became the early Gramophone of the American Gramophone Company.

Contemporaneously, Edison, working independently, developed a recorder for making cylindrical hill-and-dale records in wax, and a reproducer, which later became known as the Phonograph. As in the case of the Bell and Tainter machine, ear tubes were necessary for the use of the listener.

About the year 1887, Emile Berliner developed a disc record of the lateral-cut type—recording lateral vibrations of the needle. The special screw feed mechanism which was required on the cylinder reproducing machines was no longer necessary. The Berliner process used a zinc plate or disc coated with a fine layer of acid-resisting material. The recording stylus produced a spiral groove, cutting through the acid-resistant coating. The disc was then subjected to an acid bath in which the acid would eat in the zinc a groove of sufficient depth to vibrate the stylus of the reproducing machine. This zinc plate was then used as a “master” from which, by suitable processes, commercial records were made in a hard material. His reproducing machine was called the Gramophone and the reproduction was loud enough to eliminate the use of earphones. Because of the action of the acid on the zinc, the scratch was almost sufficient to drown out the music or other recorded sound.

Eldredge R. Johnson, who was operating a small machine shop in Camden, New Jersey, at this time, became interested in the Berliner machine. He refined and improved it. In 1896, he began the manufacture of the Gramophone for the Berliner Company. Johnson developed the spring motor—previous reproducing machines were operated by hand—and patented it in 1898. As a result of this, he was given reciprocal rights in the Berliner patents and worked in conjunction with the Berliner Company until 1901, when the Victor Talking Machine Company was founded. During the next twenty-four



years, the talking machine evolved from the first hand-driven model through the horn type operated by a spring motor to the cabinet model Victrola. In 1925 came the revolutionary Orthophonic Victrola and then the Electrola.

Prior to 1925, all recording was done by the acoustical method. Sound waves set up by the recording artist or artists caused a diaphragm to vibrate, which directly actuated the recording stylus. Artists worked under great handicaps in those days. Members of orchestras had to be seated so closely together that they hardly had room to play. Some musicians had to be placed on high chairs or benches so that the tones of their instruments could be directed toward the recording horns. The number of instruments which could be recorded at one time was definitely limited. Orchestras of twenty instruments presented tremendous problems, whereas today hundreds or thousands can be recorded without difficulty. Regular violins could not be used and it was necessary to resort to what was known as the Stroh violin. These Stroh violins were made with horns attached to them so they would throw the sound in one direction. The tone quality was essentially poor. When orchestras were recording, violinists often had to play so close to the other members of the orchestra that they would sometimes run their bows up the bell of a clarinet playing directly above them or into one of the other musician's eyes. The confusion which often resulted can be imagined readily.

There are many tales of strange and interesting happenings in the studios in those days. Famous artists would often become panic-stricken when placed in front of the recording horn. One star on his first recording got halfway through his first song, broke down, picked up his hat and coat, ran out of the studio, and left the orchestra sitting there. It was months before he could be coaxed into the studio again for a second attempt.

In 1925, electrical recording was introduced. Many of the former difficulties vanished but they were replaced by other more important problems. Much had to be learned about electrical recording. The microphone replaced the recording horn. The recording stylus was actuated by electrical impulses. High frequencies as well as low frequencies never before recorded were engraved on the surface of the wax. It was possible to record large symphony orchestras. No longer did the musicians have to be crowded together. They could play as they did on the concert stage.

Since 1925, the laboratories have worked continuously on improvements in electrical recording. As a result of these improvements, the

present "Higher Fidelity" type of recording was developed. Properly reproduced, the Higher Fidelity record of today will give satisfactory reproduction of frequencies from approximately 60 to 8500 cycles.



*Photo Courtesy RCA Victor*

### **A Recording Session in the Early Days**

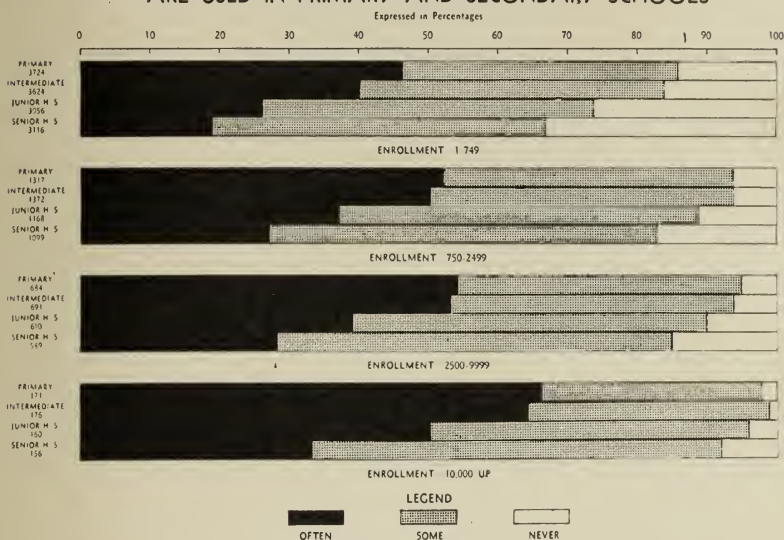
The best transcriptions have a range of 30 to 10,000 cycles, but very few phonographs will reproduce that range. Probable further developments in recording and reproduction will increase the normal range to cover even higher frequencies.

### ***Phonograph Records in Schools***

So far as is known, the first phonograph record was used in a classroom for instructional purposes in 1909, in the public schools of Milwaukee, Wisconsin. It is a matter of record that the first important move toward utilization of the phonograph record among schools on a national scale was on April 1, 1911. At that time, the Victor Talking Machine Company brought to Camden, New Jersey, an enterprising music supervisor from the Milwaukee City Schools. This enthusiastic young woman, Frances Elliott Clark, the first teacher to use phonograph

records for instruction in music, believed that a major function of recorded music was to teach music and music appreciation. She believed it should be taken into classrooms throughout the land, so

### EXTENT TO WHICH PHONOGRAPH RECORDS ARE USED IN PRIMARY AND SECONDARY SCHOOLS



*Graph Courtesy Office of Education (1936 Survey)*

children might learn to know and appreciate good music by hearing the finest compositions, reproduced from recordings of the world's greatest artists and musical groups. This belief has been substantiated by a steady increase in the use of recordings in schools. It has been attested further by the fact that phonograph records are used more extensively by schools today than are any of the other types of visual, sound, or audio-visual aids to instruction.

The graph on page 12 shows the extent to which all types of audio-visual aids are used among junior high schools. The graph which appears on this page shows the extent to which phonograph records are used among all types of schools, from the primary through the secondary, and among schools of all sizes. It is likely that the percentage of use has increased considerably since the survey was completed in 1936.

Teachers of music consider phonograph records to be indispensable classroom tools. Records are used to teach rhythm to pupils of all ages. Recordings of children's songs are used to teach songs to individual pupils and to groups. Records which illustrate individual instruments of the orchestra serve well in teaching the sound of each. Other records teach the function of each in producing the stirring or soothing combinations of sounds resulting from group performance.

Records are used as patterns for vocal or instrumental performance, individually and in groups. Other records teach the types of music and bring to the classroom illustrations of music of all ages and nationalities. Records aid in studying and learning folk songs and folk dances of the world. Various applications of phonograph records in the teaching of music and music appreciation are almost unlimited. The study of music appreciation, including "Music Literature," "Knowing the Composer Through His Music," "Music History," etc., has come to be the central element in teaching music in the schools, especially in the higher grades and in the colleges.

The now familiar survey of music in colleges, and the resultant action of the Carnegie Foundation in donating to a goodly number of these upper schools a large and comprehensive library of records, gave immediate proof of the findings of the Committee, viz.: that appreciation through much hearing is the only way to reach the student body in a democratic presentation of music as a general cultural subject open to all.

Many persons have the impression that phonograph records are effective only in teaching music and music appreciation. It is true that records are used more extensively for these purposes, but there are many other purposes for which they can be, and are being used effectively in classrooms and with school groups.

There are records which illustrate proper pronunciation and enunciation of foreign languages. Recorded speech aids in teaching the correct use of spoken English. Shorthand-dictation exercises are used for speed practice. Rhythm records are used in penmanship and typewriting classes. Other rhythm records are used extensively by physical-training instructors of large and small groups of all ages. Recorded music of various periods and nationalities is integrated with the study and teaching of literature, nature study, geography, history, and other natural and social sciences.

A more recent development in phonograph records promises to make available for class use many of the best educational radio programs. It is difficult in many instances for schools to adjust their



teaching schedules to utilize certain instructional radio programs to the best advantage. Recordings of these programs will make it possible for the classroom teacher to use the material when best suited to the



*Photo Courtesy RCA Manufacturing Co., Inc.*

### **Phonograph in Classroom**

teaching plans, and as often as may seem desirable.

The Committee on Scientific Aids to Learning has been conducting experiments in conjunction with the State Departments of Education in New York and Georgia to determine the many practical applications of recordings. These recordings have been designed for classroom use and many of them include no music or only incidental music to bridge the story. In other words, the recordings are stories and dramatizations intended to bring into the classroom experiences which would be difficult to provide economically in any other way. The Los Angeles Public Schools have been using a series of recordings for several years and find them to be in considerable demand among teachers.

A more recent development, in the utilization of phonograph records, is the tendency on the part of state and city visual-instruction bureaus to provide recordings on loan. The University of Kansas was one of the first to provide such recordings for use in foreign-language ex-



tension courses and has recently increased this service to include many of the best recordings in the fields of English, literature, history, and the other social sciences.

### *The Radio Program*

It is probable that the use of radio in schools for instructional purposes is receiving more attention among schools and educational-service agencies than any of the more recent sound aids to learning. The National Broadcasting Company, Columbia Broadcasting System, Office of Education, and many smaller organizations are giving careful consideration to ways and means of utilizing radio to the greatest educational advantage. The problems are many. Some may require years to solve. The interesting phase of the situation is that broadcasting facilities, Government agencies, and schools are working together, experimenting, planning, and replanning, all for the ultimate benefit to the Johnnies and Marys in the classroom and to the older Johns and Marys who are no longer receiving formal instruction in the classroom.

One of the major problems is that of determining just which type of program is most effective in education. Education in the past remained rather harsh and sometimes distasteful, for disciplinary purposes. It is now very easy to turn the dial if the program has not sufficient appeal to the listener. Accordingly, it has been necessary to change the method of presentation—to catch and to hold the interest of the listener. Some programs have been too dull and others too entertaining to accomplish the desired result. The successful educational radio program of today is one which sets out to accomplish definite objectives and does so by following certain procedures. The bulletin “Education by Radio” presents a summary of “Guideposts for Producing Educational Programs,” which should provide a clear impression of some of the problems of educational broadcasting:\*

“Apropos Mr. Boutwell’s claim for the mass appeal of educational programs, some readers may want to know the guideposts by which such programs are prepared. They are of two kinds: those which have to do with educational objectives, and those which are concerned exclusively with the problem of attracting and holding an audience.

“The following tentative educational guideposts have been suggested to writers connected with the Educational Radio Project:

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\*“Education by Radio,” Vol. 7, No. 4, April 1937. National Committee on Education by Radio, One Madison Avenue, New York City.

"1. Does the program have unity; that is, do the parts contribute to a central idea which, in turn, is a logical sector of a program series?

"2. Is the subject matter selected educationally important? A good test of importance is whether or not the facts or anecdotes would be included in the curriculum of a progressive school system.

"3. Will the program effectively induce a considerable proportion of listeners to explore the subject more completely by reading, by discussion, or other self-educative activity?

"4. Is there a summary at the close to fix in the listener's mind the major points brought out by the script?

"5. Is the selection and presentation of the material such that the voluntary interest of the 'students' (listeners) will be aroused?

"The guideposts for attracting and holding the attention of a radio audience are more numerous and perhaps less tentative. They include and supplement good practice in playwriting, which is almost a prerequisite for scriptwriting. They are as follows:

"1. Listener attention should be caught in the first twenty seconds. Methods: novelty sound, theme music, interest-challenging statement, of provocative dialog.

"2. The first minute of the script should arouse the curiosity of the listener in what is to follow.

"3. Direct the program to the audience most likely to be listening on the station or stations being used at the time allotted. Are they women, children, men tired from a day's work, city people, country people? Keep in mind what a majority of listeners are likely to be doing while you are seeking their attention. Try to fit your program to what you think their mental state is at the moment.

"4. Limitations of listeners both in terms of vocabulary and experience should be kept in mind. Don't ask listeners to make mental expeditions too far beyond the range of their power.

"5. The subject of the broadcast must be potentially interesting to a majority or a reasonably large proportion of listeners reachable at the time and through the outlets available.

"6. The presentation should include listener participation, if it is nothing more than keeping time to music, laughter, using paper and pencil, or even more important, an emotional response, a desire to do 'something about it.'

"7. Visualize scenes and people before beginning action; that is, 'set the stage.'

"8. Each voice or sound should be clearly established; that is, listeners should not be left wondering who a speaker is or what a sound

is. All future behavior of a character should be motivated beforehand.

"9. Each line of dialog should be as short as possible and to the point, without hurting characterization or dramatization.

"10. The script should 'flow.' Even more essential than on the stage or in a moving picture, because of the limited time and holding power, the lines of a radio script should advance the plot or the subject matter steadily toward the climax.

"11. Variety is essential. No actor or group of actors should be asked to carry a scene longer than interest in a particular situation can be maintained—about two minutes.

"12. The script should continually remind listeners of others present in the scene, even if they are not speaking.

"13. Sounds and action should be properly prepared for in advance; this is, if the Indians are coming, anticipation of the sound of hoofbeats must be built up in advance.

"14. Characters should speak in character; residents of a particular place should speak like residents of that place.

"15. If an address to which mail is to be sent is used, it should be repeated at least three times. The same holds true for the name of the school, agency, or company. Any offer used at the close of a broadcast should be prepared for at the opening.

"16. Directions for the production director and music director should be ample and clear."

The problem of utilization of radio programs in the school is another which puzzles many who desire to offer every educational advantage within the school. It was stated earlier in the discussion of motion pictures that the presentation of a reel or two of film is not teaching and may be an utter waste of time. Similarly, the mere listening to a radio program—the best on the air—may or may not have instructional value, largely depending upon the way in which the program is used. It is possible to secure advance information concerning the most prominent series of educational programs. These advance announcements or bulletins usually contain sufficient information to guide the teacher in preparing classes for intelligent reception.

Some programs, such as the NBC "Music Appreciation Hour," CBS "School of the Air," health lectures, correct-speech demonstrations, and the like, are suitable for a major part or all of the student body. Other programs in science, geography, history, etc., should be utilized by those groups which will be able to relate the radio lesson to the scheduled classroom procedure. Otherwise much time may be applied at a disadvantage or entirely wasted.

The varying curricula of schools present a problem to the educational broadcaster and to the teacher who would make effective use of the best educational radio programs. It is impossible to arrange educational broadcasts to fit the schedules of all schools. Similarly, it is impossible for all schools to standardize instruction to the point where a radio subject or series—except for certain general programs for the entire student body—can be utilized in all schools at a given hour, day, or week. These programs may be solved by the recording of the most effective radio programs, as discussed later. Another aid to the solution of some of the problems is suggested in the later discussion of centralized radio-sound distribution equipment.

The paramount advantage of the educational radio program is that it can be used with equal effectiveness by the smallest rural school in the land; by the school in a town of moderate size; or by the largest city school or school system. The rural school without electricity can secure at low cost a battery receiving set which will provide satisfactory reception year after year. The larger school may use individual receiving sets or centralized radio-sound equipment to reach any or all rooms and the school auditorium with clear reception. In any case, the programs which have cost thousands of dollars to produce are available without charge and the equipment may be secured and maintained at negligible cost per pupil. In all cases, the selection of equipment should be based on the quality of performance rather than on price. Frequently the saving of a few dollars in original cost of equipment may prove to be the least profitable investment. Equipment of poor quality, rendering unsatisfactory service, will do more to deaden a powerful instructional tool than will any other factor.

The production of radio programs for broadcasts and mock radio programs for use over the radio-sound system is becoming one of the most effective methods of applying radio technique to instruction in music, speech, dramatics, history, geography, science, and many other subjects. A script exchange offered by the Office of Education\* provides a wealth of effective instructional material for use in schools, CCC camps, and other educational groups. Many broadcasting stations offer their facilities to schools at little or no cost for the presentation of such programs, if well done. Many larger schools and school systems are making regular use of such facilities. The motivating power of these local productions is an immeasurable force, resulting in volun-

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\*Federal Radio Project, U. S. Office of Education, Federal Security Agency, Washington, D. C.



tary research, reading, and study which could be obtained in no other way.

For many years numerous universities and colleges have maintained



*Photo Courtesy RCA Manufacturing Co., Inc.*

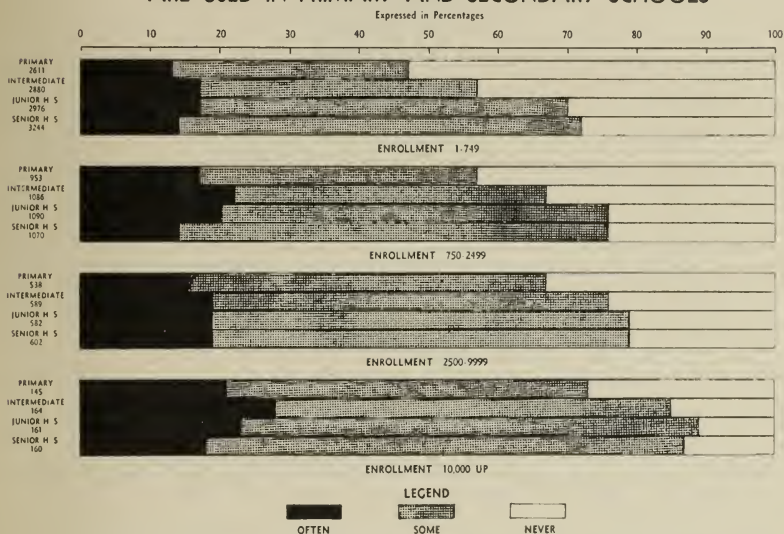
#### **Radio Guild Production Goes on the Air**

standard band broadcasting facilities to serve the states or areas in which the institutions are located. Many of these stations have provided excellent educational programs both for the objective training of persons enrolled in extension courses and for the guidance of the public engaged in agriculture, industry, recreation, etc. These stations have been used also to disseminate information concerning the normal and extra-curricular activities of schools and colleges. Programs produced by students have provided excellent training in music, speech, and dramatics.

The Federal Communications Commission in 1938 assigned certain ultra high frequency bands to the exclusive use of educational radio broadcasting stations. The Board of Education of the Cleveland Public Schools was the first to utilize this new frequency assignment with the installation of a radio station to serve schools exclusively. This was an experimental program which met with such outstanding success that numerous other city and state systems made plans to install similar broadcasting facilities. In July 1940, the Federal Communications Commission modified its rules governing educational

broadcasting stations and allotted five bands 42,100-42,900 kilocycles with the stipulation that frequency modulation should be employed. Such educational broadcasting stations are now in operation in Cleve-

# EXTENT TO WHICH RADIO PROGRAMS ARE USED IN PRIMARY AND SECONDARY SCHOOLS



Graph Courtesy Office of Education (1936 Survey)

land and San Francisco and transmitting equipment is being installed by the Chicago Radio Council. It is anticipated that several other cities will soon install similar facilities.

The future of the radio in education seems limited only by the ability of teachers, supervisors, and school executives to plan their educational procedure so they may utilize the effective programs at their disposal. Past and current activities of both private and governmental broadcasting facilities establish the fact that those agencies will provide to the best of their ability the educational programs which will be most effective in instruction. This is further attested by the widespread activities of city, state, and university broadcasting stations which are offering excellent educational programs to the schools in the areas which they serve.

### ***Radio Recordings***

The preceding discussion of the radio program suggested one of the difficulties encountered in applying radio programs to instructional procedure. Many times the radio program is not on the air when it would be most convenient for the class or section which should secure the greatest benefit from the program. This means that it is necessary to disrupt other class schedules and plans or miss the program entirely. The latter is the easiest solution, and one that is used too frequently.

A more logical solution of the problem, which is receiving the attention of broadcasting facilities and schools, is that of recording the radio programs for use over and over again with different classes or sections, and for use at the time when the instructional material fits the teaching schedule. These recordings of radio programs are known as transcriptions. This means simply that the program has been recorded for reproduction.

A plan to make available many excellent recordings of radio programs is being put into operation by at least two of the large broadcasting companies and by the Federal Radio Project, U. S. Office of Education. This plan provides for the preparation of transcriptions or radio recordings of leading educational broadcasts for use among schools. These radio recordings provide that important and frequently missing link between the broadcasting studio and the classroom. The radio recordings are offered for sale at reasonable prices and, as with motion-picture films, will be offered for temporary school use at low cost through state and city service bureaus. This will make it possible to fit desirable material into the teaching schedule and will eliminate the need for adjusting the daily routine to fit broadcast schedules.

It is not anticipated that this new radio recording service will cover all programs of merit. Such programs as the Damrosch "Music Appreciation Hour" of the National Broadcasting Company and Columbia's "School of the Air" fit the teaching schedule and should be heard as they are presented. Also, important international news broadcasts and special events should be heard while on the air. On the other hand, there are many fine programs in the fields of science, dramatics, literature, history, health, geography, etc., which will be more convenient to use as recordings.

Transcription play-back equipment, now available, makes it possible to use these fine teaching materials—scientific aids to instruction—

when and as needed. This equipment ranges in price from \$110 to \$150, complete. Also, special record-playing attachments are available for use with radio receiving sets, public-address equipment, and sound motion-picture projectors.



*Photo Courtesy RCA Manufacturing Co., Inc.*

### **Two-Speed Phonograph**

An explanation of the difference between phonograph records and transcriptions (radio recordings) seems to be in order at this point. The standard phonograph record is recorded on a recording wax which revolves at the rate of 78 revolutions per minute. As the wax revolves at this rate, the sound is registered in undulating lateral waves in spiral grooves of which there are approximately 100 to the inch. The average ten-inch phonograph record can accommodate a maximum of approximately three minutes and fifteen seconds of recording on one side. A twelve-inch record can be used for a recording period of approximately five minutes. The process of making a transcription record is approximately the same, except that the transcription wax revolves at the rate of  $33 \frac{1}{3}$  revolutions per minute, making it possible to record for fifteen minutes on one side of a sixteen-inch disc or for ten minutes on one side of a twelve-inch disc. In either case, pressings are made after due processing and the resulting records, or transcriptions, must be played on instruments which revolve the record



or transcription at the speed at which it was recorded. In other words, the phonograph which reproduces the phonograph record must revolve the record at the rate of 78 revolutions per minute while the transcription-reproducing equipment revolves at the rate of 33  $\frac{1}{3}$  revolutions per minute.

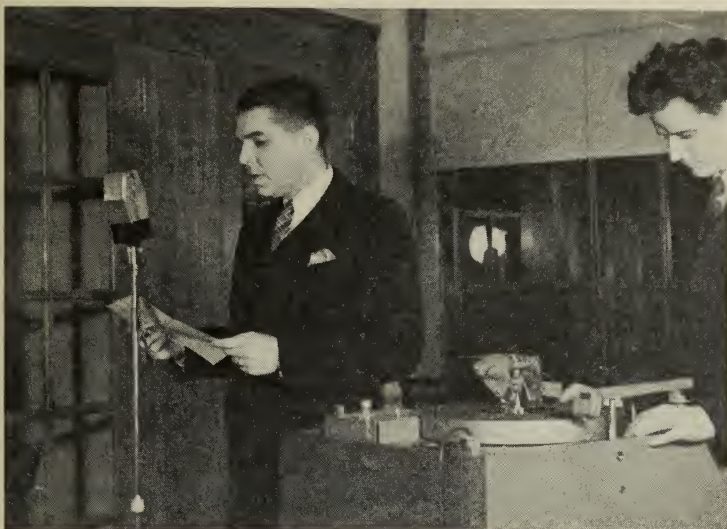
Each type of recording has certain advantages. The transcription record makes it possible to record and reproduce for a full fifteen minutes without interruption to change or turn the record. The maximum recording on one side of a twelve-inch phonograph recording recorded at standard phonograph speed is approximately five minutes. This means that in recording and reproducing a fifteen-minute program of phonograph records it will require two sides of one record and one side of the second record. On the other hand, the phonograph records may be used on any standard phonograph, whereas the transcriptions must be used on special equipment which revolves the record at slower speed. It is not known which type of record will be used most extensively for the purpose of recording radio programs such as the DuPont "Cavalcade of America"; and some programs are available on both types, but there seems to be a preference for sixteen-inch recordings. In either case, a school may now purchase for permanent use the best recorded educational programs at nominal cost per program. The advantages of this will be recognized immediately.

### *Instantaneous Recording Equipment*

The usual phonograph records or transcriptions are made by recording on wax. The wax is then processed to provide a master from which, after further processing, a matrix is made. The matrix is used to press the records which are reproduced on phonographs or other record-playing equipment. This procedure requires several hours of careful labor of skilled technicians, and the result is the fine phonograph record which may be purchased almost anywhere for a dollar or less. The process of manufacture is moderately expensive, so is not used generally except when many copies of the recording are desired.

The instantaneous recorder, on the other hand, may be used to record speech, music, or any other type of audible sound on a "blank" recording disc and reproduce that recording as soon as completed, with no processing required. Recording discs range in price from 15c upward, and may be used to record several minutes of individual or group performance. The records may be used many times and ad-

ditional copies may be prepared either by re-recording (dubbing) or by using duplicating processes similar to those applied to wax recordings.



*Photo Courtesy RCA Manufacturing Co., Inc.*

### **Recorder in Use**

These recorders are available in three general types, to accommodate almost any situation. There are small portable recorders which can be carried from one room or building to another as required. These small instruments are usually equipped to record on six-, eight-, ten-, or twelve-inch discs, at 78 revolutions per minute. The resulting records may be played on the recorder or on any standard phonograph. A larger semiportable or console-type recorder is built to accommodate all sizes of records up to sixteen-inch transcription discs, and will record at either 78 or 33  $\frac{1}{3}$  revolutions per minute. The principal advantage of the slower speed of operation is that it permits recording about two and one-half times as long as the recording time at 78 r.p.m. on a recording disc of any given size. The chief limitation is that 33  $\frac{1}{3}$  r.p.m. recordings cannot be reproduced on standard phonograph equipment which revolves at 78 r.p.m.

The third general type of instantaneous disc recorder is the recording attachment which is used with a school radio-sound system to record any sound which is being distributed over the sound system,

or to record any type of individual or group performance. In addition, it may be used to reproduce, through the radio-sound system, any type of disc recording—phonograph record or transcription.

A more recent development in the field of instantaneous recording, is a recording and playing back instrument which utilizes magnetic tape. This instrument provides for the recording and the instant playing back of a few minutes of speech or musical performance but does not provide a permanent record of that performance. Such a record may be produced by re-recording from the metal tape to a disc recording. The instrument does provide excellent facilities for practice and the correction of difficulties in performance.

The possible and practical uses of instantaneous recording equipment are almost unlimited, and new uses are being discovered daily. It is used in all grades and with adults to detect and correct speech irregularities or difficulties. Such recordings permit the pupil to hear himself as others hear him—and he knows the recording doesn't lie! They also permit the pupil to measure his own progress by comparing early recordings with later ones.

Teachers of speech, dramatics, languages, and other subjects involving speech and voice training, have long needed some objective measure or means of making a comparison of progress. Usually progress or lack of it can be detected during a semester or a year, but frequently the change is so gradual that it is difficult to determine its extent after or during any given period of instruction. Accordingly, teachers of those subjects are finding it exceedingly important to make recordings of speech or other individual performances at the beginning of a course of training so these recordings may be compared with later recordings by the same pupils after they have received a part or all of the scheduled training. There is no other way to secure an objective measure of progress.

Teachers of music, vocal or instrumental, are faced with much the same problems and will find a good recorder to be a first-class assistant. There are many times when music teachers would welcome an opportunity to let Johnny or Mary, or an entire group of pupils, know how he, she, or they really sounded in performance. The recorder provides an accurate sound photograph which will be helpful to both pupil and teacher. Furthermore, it will eliminate the personal element and errors of human judgment.

Individual pupils or groups of pupils who perform in radio programs are required to perform with split-second accuracy. Again, a good recorder will be invaluable in rehearsals. Sometimes these record-



ings may be used for repeat performances, over the school sound system or over another radio broadcasting station.



*Photo Courtesy RCA Manufacturing Co., Inc.*

#### **Recording to Detect and Correct Speech Irregularities**

A rifle team of the University of Kansas may compete in a match with a team of the University of Maine, and neither team leave its campus. Each team will shoot a series of targets and the scores are compared by mail. Similarly, a school debate team, glee club, band,



orchestra, chorus, quartet, or individual musician may enter into a contest against the performance of any other group or individual by using recordings. This procedure has been used effectively in debate work for many years and is now becoming common in musical performances.

The most modern recording instruments are simple to operate, reliable in performance, and require very little attention to keep them in first-class condition. Any teacher can soon learn to make excellent recordings. One necessary precautionary measure is to place the recorder in a room where it is protected from extraneous sounds or vibration, as a good recorder will record all sound which reaches the microphone.

### *Sound Amplification or Re-Enforcing*

The problem of providing sufficient sound to reach all corners of an auditorium or other space with clearness has confronted individuals and groups since the time when the Roman senators were elevated to their lofty positions largely because of the stentorian qualities of their voices. It is no longer necessary for the individual or group to endure unusual stress and strain in order to reach the ears of the audience, regardless of the size of that audience. Simply operated sound-amplifying equipment makes it possible for the person or group to perform at normal speech or sound levels and have that performance amplified to reach any audience.

The required equipment may range from a small portable amplifying or public-address system costing less than \$100 to an elaborate arrangement of amplification and speakers which will accommodate any audience or type of program. A portable public-address unit capable of re-enforcing sound to accommodate an audience of 2500 to 3500 persons may be purchased for less than \$200. Equipment of this type may be used in the school auditorium, in the gymnasium, on the athletic field, or on the school playground with equally satisfactory results. One will recognize at once the value of being able to amplify sound in any or all of these instances.

The majority of the portable and stationary sound-amplifying equipments are so arranged that they may be used to reproduce and re-enforce music or speech which has been recorded on phonograph records. A simple record-playing device, costing less than \$20, may be attached to the sound system for this purpose. Similarly, it is possible to amplify radio reception with the same type of equipment, if the receiving set does not have sufficient volume to accommodate the

space or group where the program is utilized.

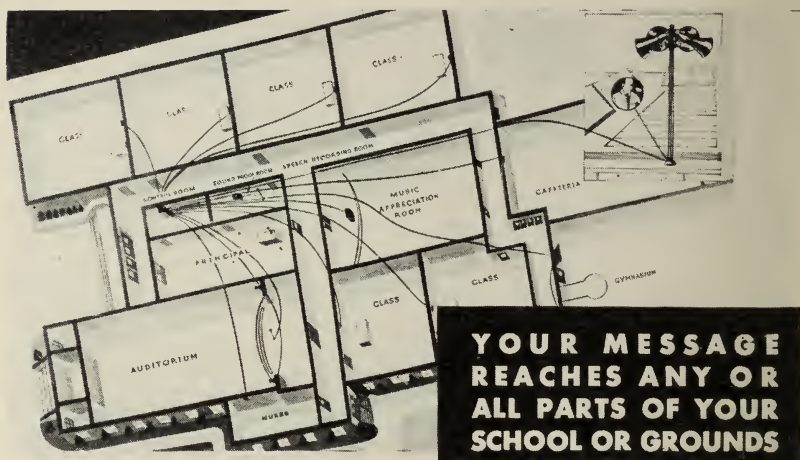
The selection of sound re-enforcing equipment for any purpose should be based upon the recommendations of a sound engineer who is familiar with the requirements. Frequently savings may be effected or more satisfactory equipment may be secured by observing this suggestion. The principal manufacturers of sound equipment are prepared to provide such advice without cost or other obligation to the school. In one instance a school which made use of this service was able to secure a thoroughly satisfactory sound re-enforcing unit at approximately \$100 less than the estimated cost based on catalog information. There are occasions, also, when one type of microphone may provide much more satisfactory service than another, therefore, its selection should be based upon the recommendation of a sound engineer.

### *School Radio-Sound Systems*

Another comparatively recent development in the sound field is a combination of radio reception, sound reproduction, amplification and distribution equipment, generally known as a school radio-sound system. This equipment makes it possible to convey any type of sound to any or all rooms within a school building or group of school buildings. The usual arrangement of such a system is to provide for a central control apparatus in or near the office of the school principal, making it possible for him or for one of his assistants to send a radio program, music or speech from a phonograph record, announcements, lectures, debates, plays, or any other type of program to any room, series of rooms, or to the entire building.

The cross-section illustration (page 150) shows how the central-control unit is connected to various rooms. Another illustration (page 154) shows the detailed arrangement of the control mechanism which makes it possible for the operator to distribute programs as desired. For example, it is possible to send to the classes in geography a program in which those groups would be interested. At the same time, the classes in history or general science might receive an entirely different program. It is also possible that the principal might desire to make certain announcements to still other groups without interrupting those who are receiving the geography, history, or general-science programs. The central-control mechanism makes it possible to accomplish all this with ease, thus providing an adaptability which could not be accomplished as readily in any other way. A good school radio-

sound system lightens the principal's administrative duties, increases efficiency of teaching, and enriches the school curriculum to benefit both pupils and teachers.



*Photo Courtesy RCA Manufacturing Co., Inc.*

### Diagram of a Model School Sound System

A complete school radio-sound system includes the following:

1. A centrally controlled cabinet, usually located in or near the principal's office, containing:
  - (a) Two or three connections to each classroom.
  - (b) One or two radio receivers.
  - (c) A phonograph turntable.
  - (d) A microphone input connection.
  - (e) Connection for a recording attachment.
  - (f) A monitor speaker.
  - (g) Appropriate amplifiers and tubes.
2. Speakers in all classrooms.
3. Special speakers in the auditorium, gymnasium, cafeteria, and on the athletic field.
4. One or two microphones and microphone locations throughout the building:
  - (a) In the principal's office.
  - (b) In the auditorium.
  - (c) In the music room.



*Photo Courtesy RCA Manufacturing Co., Inc.*

**Control Cabinet of a School Sound System to Accommodate 20-120 Rooms**

- (d) In the dramatics department.
- (e) In the public-speaking department.
- (f) In the gymnasium.
- (g) On the athletic field.

The following outline of common uses of a school sound system should indicate the possible values to be derived from such equipment in any school situation.

**I. General Administrative Uses:**

1. Announcements (to any or all classrooms):
  - (a) Daily spoken bulletins to teachers and pupils. (More effective than in written form.)
  - (b) To call faculty, departmental, class, or club meetings.
  - (c) To check and encourage attendance and punctuality among pupils.
  - (d) Electric chimes can be used in place of bells, to indicate opening and closing of usual class periods.
2. Communication:



- (a) Direct communication with teachers or pupils in any classroom, without interfering with classroom procedure by calling on a telephone or by sending a messenger.
- 3. Emergency:
  - (a) Principal may locate a teacher or a student quickly in case of an emergency.
  - (b) In case of fire, pupils may be directed along routes which avoid danger. Fire drills and other safety precautions may be directed to any or all parts of the building.
- 4. Discipline:
  - (a) Absence of the teacher from the classroom does not leave the pupils without control.
  - (b) Natural-voice amplification in the auditorium lessens restlessness and avoids disciplinary problems.
- 5. Increased efficiency:
  - (a) Eliminates the necessity of frequent special assemblies.
  - (b) Where the school auditorium is too small to accommodate the entire student body, the programs may be sent from the auditorium to overflow groups of students in classrooms or study halls.
- 6. Student training:
  - (a) Student-council discussions of important problems may be relayed to the entire student body.
  - (b) The reading of the Scriptures or other opening exercises may be conducted over the sound system.
  - (c) Presentations of radio guild productions, plays, musical programs, voice training, public speaking, microphone techniques—all may be accomplished by students.
  - (d) Students develop poise by presenting special reports to one or more classes in history, English, literature, science, etc.
  - (e) Members and leaders of clubs, classes, and other school groups can use the system for appropriate announcements to the student body.
- 7. Controlled testing:
  - (a) Psychologists may give controlled tests to similar groups in unison, thus avoiding variation in the testing procedure which might effect the validity of the results.
  - (b) Teachers may give the same tests to two or more sections simultaneously, with assurance that the timing factor is controlled.



*Photo Courtesy RCA Manufacturing Co., Inc.*

### **Speaking at the Microphone**

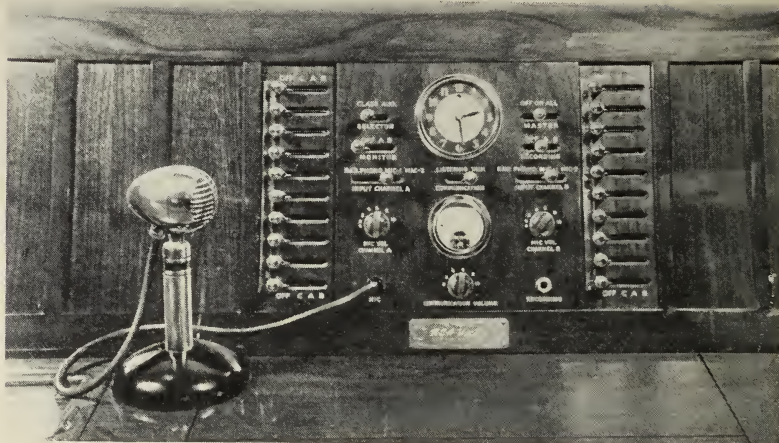
## **II. Classroom Instruction.**

### **1. Radio programs:**

- (a) National network programs in music and music appreciation, dramatics, science, health, history, geography, and other subjects.
- (b) International and domestic broadcasts, covering current events, news bulletins, important speeches of national leaders, etc.
- (c) Foreign broadcasts in native languages for students of those languages.
- (d) Programs of local and educational broadcasting stations, planned to enrich the curriculum.
- (e) Radio recordings of important broadcasts repeated as needed in the teaching schedule.

### **2. Special subjects:**

- (a) Teaching of art and music appreciation may reach any



*Photo Courtesy RCA Manufacturing Co., Inc.*

### **Control Panel of a School Radio-Sound System**

part or all of the student body as desired.

- (b) Health, hygiene, and other special subjects may be presented to selected groups including any desired number of classes.

### **III. General School Activities:**

1. Recorded or radio programs may be presented in the auditorium when school band or orchestra is not available.
2. Musical programs by the glee clubs, band, orchestra, or chorus may be sent to any or all rooms or to outdoor groups.
3. Recorded music may be played for dancing or dancing-class instruction in the gymnasium, for the changing of classes, or as background music during plays or other special programs, indoors or out.
4. Broadcasts of significant public events, inaugurations, etc., may be presented before special assemblies.
5. Recorded sound effects may be used for presentation of plays, radio guild productions, etc., or sound effects may be produced away from stage.

### **IV. Extra-Curricular Activities:**

1. Sports announcing and commentary at outdoor games, track meets, football games, etc.
2. Sound amplification for special exercises on school grounds, such as May Day, Memorial Day, and dedications of new buildings.

3. Commentary on indoor sports, such as basketball games, gym meets, indoor track, swimming, etc.
4. Presentation of Christmas carols and other community programs to large indoor and outdoor audiences.
5. Recordings of special programs by use of the recording attachment. Such recordings provide an excellent record for future reference.

This list could be expanded indefinitely and, as stated above, new and important uses will be discovered from day to day as the school sound system becomes familiar to principal, teachers, and pupils. In some cases, the centralized sound systems of two or more schools are interconnected by telephone lines so a program originating at one school may be sent to all rooms of that school and to all rooms of the other schools connected with it.

Again, it is suggested that those interested in the installation of this type of equipment should request the assistance of qualified sound engineers who are available for such service. It is impractical to suggest a possible price range, as very few schools have identical requirements, but quotations may be obtained quickly from any of the leading manufacturers of school sound systems. Their advertisements appear in the principal school journals and a list of principal manufacturers appears on page 224.



## IV

### Types of Audio-Visual Aids to Instruction

IT should be noted that the preceding discussion of aids to teaching was placed in two general groups—types of visual aids, and types of sound aids. In the former, consideration was given to pictorial or graphic aids of all types. In the latter group, consideration was given to sound aids which depend upon sound for their value and have no direct connection with the preceding visual aids. It is true that some of the visual aids might be used in conjunction with sound aids with thoroughly desirable results. Such combinations of aids will depend almost entirely upon the ability of the teacher to recognize the elements in each which should be combined for effective results. The discussions which follow will concern those combinations of pictures and sound which depend upon positive synchronization for their effectiveness.

#### *The Sound Filmstrip*

The sound filmstrip might be termed a combination of the ordinary filmstrip and the phonograph record or transcription, which were discussed earlier. The sound filmstrip is composed of two major parts. One part is the series of still pictures printed on 35 mm. motion-picture positive for projection by use of a filmstrip projector. Such a strip of film may include any desired number of frames or individual pictures. The other part is the recorded sound which illustrates or explains the picture series. This combination of sound and picture is projected and reproduced by means of a simple instrument, one section of which projects the picture to a screen before a group and the other which reproduces and amplifies the sound so it may be heard clearly by all members of a group.

The sound filmstrip, known in the industrial field as the sound strip film or filmstrip, has been developed by industry for sales and educational purposes. A central agency may prepare and record a discussion of new models, new sales plans, the story of a product, or any one of hundreds of other topics and distribute the resulting sound filmstrip to dozens or hundreds of branch offices or salesmen for use simultaneously. It is really a convenient means of communication when either a long or short story must be told effectively. The sound filmstrip is used by all types of industries largely within

their own organizations, and is used in many instances to tell the story of their products to the public. Several of the Government agencies are using the sound filmslide to disseminate information concerning their functions and achievements. In other cases they are using sound filmslides for instructional purposes.

The sound filmslide is not used among schools to any great extent. It is doubtful whether this situation will exist for long, inasmuch as various organizations are giving consideration to the sound filmslide for use in classrooms. The Committee on Scientific Aids to Learning,\* in order to determine the educational values of sound filmslides, is conducting experiments with various types of subjects. One such experiment was conducted by the Committee in co-operation with the Metropolitan New York Branch of the Department of Visual Instruction, National Education Association. This experiment involved the production and use of the following sound filmslide subjects:

The City Mouse and the Country Mouse  
Safety  
Graphic Representation  
Your World of Tomorrow  
Teamwork

A summary of the early results of this experiment, published in the 1941 Yearbook of the New York Society for the Experimental Study of Education, indicated the following general findings:

1. In the opinion of an overwhelming majority of the classroom teachers who used these sound filmslides, as well as in the opinion of several hundreds of graduate students and professors of education who served as reviewers, the medium of the sound filmslide is suitable for classroom use and is valuable as a teaching aid.
2. The majority of the persons who rendered judgments in connection with each of the filmslides felt, in each instance, that the particular filmslide was a valuable and effective aid to instruction. In connection with some films, however, there was a greater agreement than in connection with others.
3. In connection with the filmslides developed for use with the lower primary grades, a majority of the teachers believed that the filmslides should be shown two or more times. This feeling also holds true in connection with the remaining three filmslides, but

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\*Committee on Scientific Aids to Learning, 41 East 42nd St., New York City.

the number of teachers rendering this judgment in connection with the "Graphic Representation," "Your World of Tomorrow," and "Teamwork" is so small that the conclusion cannot be stated with the same degree of reliability as it can be in connection with the other two filmslides.

4. All the filmslides stimulated discussion and activities in some of the classes which participated in the experiment. The evidence indicates that each of the sound filmslides can readily provide a basis for useful discussion and activities if the teacher has the inclination and wishes to spend time with the class in this manner.

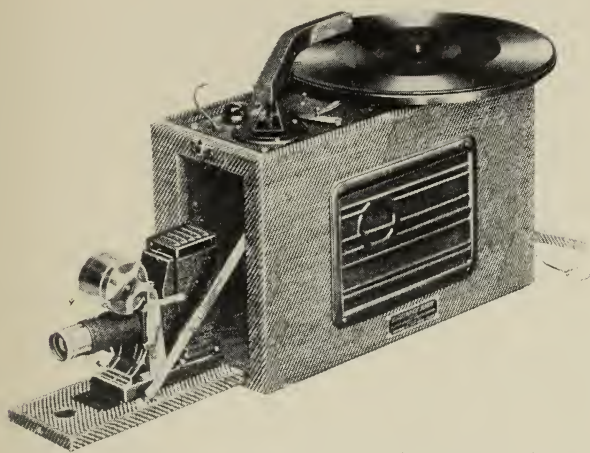
Other experiments are being conducted by the Committee, in cooperation with the School of Education, Harvard University, involving other specially prepared sound film slide subjects for classroom use. None of the major experiments have been completed, but there is some early evidence that the sound film slide, produced and used properly, will have considerable value. In industry, the high value of sound filmslides for training and promotional use has been established for several years.

The situation which affects the use of sound filmslides among schools is similar to that which affected the use of motion pictures for educational purposes a few years ago. Producers of sound filmslides state that it will not be profitable to produce subjects for use among schools until the schools have equipment on which to use those subjects. Schools do not expect to purchase equipment until there is a reasonable supply of subjects available, or reasonable assurance that such subjects will be made available as required after the equipment is secured. It is probable this deadlock will be broken as in the case of the motion picture—by some enterprising commercial organization which recognizes the potential market among schools for this type of material. Also, as in the case of the motion picture, it will be necessary for the producer or producers to work closely with the schools for the purpose of determining the exact teaching requirements.

At the outset, the chief advantage of the sound film slide will be the very low cost at which it can be produced and distributed. When sound film slide subjects are available for educational use, it is probable the film strip and accompanying record or transcription may be purchased as a unit at a cost of a few dollars. The projection and reproducing equipments are now available on the market at prices which range from \$90 to \$125, or more. The cost will be considerably less than the cost of sound motion pictures and projection equipment and, in many instances, it is probable that the projected series of still pic-

tures will be as effective as the same material in motion-picture form.

Those who may desire to prepare their own sound filmstrips for regular or experimental use may do so by preparing a series of still



*Photo Courtesy The Magnavox Co., Inc.*

#### **A Portable Sound Filmstrip Projector**

pictures on a filmstrip and recording the explanatory material on an instantaneous recorder. The record, if recorded at 78 r.p.m., may be reproduced either on a portable recorder or any standard phonograph while the pictures are being projected with a filmstrip projector. It is not necessary that both instruments be combined, as shown in the illustration, although the combination instrument is convenient to use.

#### ***The Sound Motion Picture***

A few years ago, many sound motion pictures were merely silent subjects with subtitles deleted and explanatory sound added. There was then much justifiable controversy concerning the questioned values of such sound. Many believed that the sound treatment actually detracted from potential teaching values of the films, and preferred the silent films with explanatory subtitles.

More recently, the producers of sound films have utilized sound more effectively and silent-film producers have chosen subjects which do not require auxiliary sound. There are now a majority who believe that each type of film has certain distinctive values and should be used in its appropriate place. The natural appeal of sound, however, has



caused a strong swing toward sound motion pictures as aids to instruction.

The survey\* of visual aids and visual-instruction equipment, conducted by the Office of Education in 1936, indicated that the ratio of silent to sound projectors in use among schools was approximately twelve to one. This ratio is being modified by an increasing tendency on the part of schools to purchase projectors that will show both silent and sound films. The buying of straight silent projectors has not ceased; in fact, it is reported to show a slight increase from year to year. The increase in the number of sound projectors bought recently by schools is relatively far greater, however.

The survey\*\* of motion-picture equipment in high schools and colleges, published by the Motion-Picture Division, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, 1941, reported 12,443 16 mm. motion-picture projectors and 2447 35 mm. motion-picture projectors as owned by high schools and colleges in the United States and its possessions. Of the 12,443 16 mm. projectors reported, 6059 are silent and 6384 are equipped for sound. These were reported by approximately 17,500 high schools and colleges, which would indicate that the majority have some type of motion-picture projection equipment.

The majority of the sound projectors purchased by schools are of the 16 mm. type, although some schools are installing 35 mm. sound equipment, or both, in order that the best of standard theatrical productions may be used for both educational and recreational purposes. Practically all 16 mm. sound projectors are designed to accommodate either sound or silent films, although better performance may be secured for more years by purchasing a projector designed to operate at sound speed only. A separate silent projector would be inexpensive and better suited to the use of silent films.

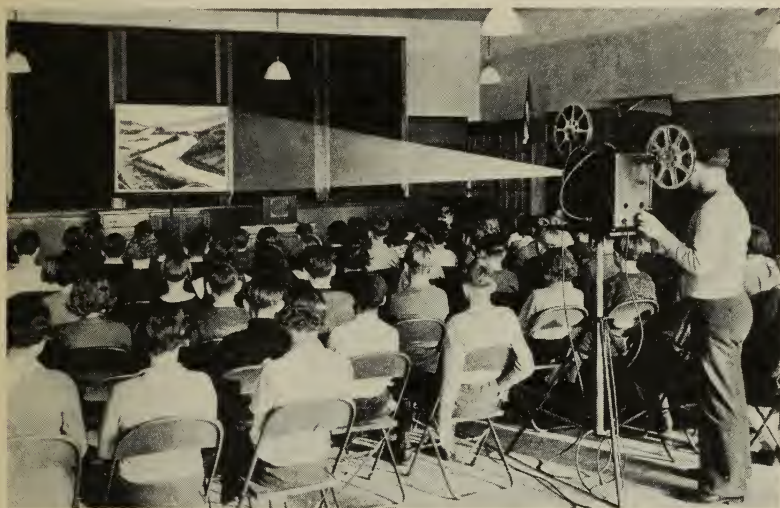
One of the greatest factors which has retarded the more widespread use of sound motion-picture equipment among schools has been the lack of a sufficient quantity and variety of good educational sound film. This shortage has been corrected and the supply is now sufficient to meet the requirements of the average school. Several important developments have contributed to this essential change.

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\*National Visual Education Directory; American Council on Education, Washington, D. C.

\*\*The published report of this survey may be purchased from the Educational Department, RCA Manufacturing Company, Inc., Camden, New Jersey, at \$3 a copy.

There is an increasing tendency on the part of city and state visual-instruction centers to purchase outright just as many worth-while sound films as their budgets will permit. Thus, in Chicago, since 1937,



*Photo Courtesy Bell & Howell Co.*

### **Motion Pictures in Classroom**

the county schools bought 30 and the city schools 152 prints of Erpi Classroom Films, as well as several hundred reels from other sources. This trend toward expansion of sound film resources is further reflected in the lending libraries. The Bell & Howell Library, which caters mainly to school service, increased its listings of sound rental films from less than 100 to 1500 titles, and, at the same time, reduced its rental rates and sale prices on many subjects.

This has encouraged production of classroom films by independents, often with the collaboration of local educational authorities. Many examples might be cited, among them "The Mail" and "Airliner" (T. A. I. E. Productions), "Elephants" and "Congo Curiosities" (Paul Hoefler), "Under the South Seas" (Arthur C. Pillsbury), "Earth and Its Seasons" and "Mysteries of Water" (Knowledge Builders), and the "World Parade" and "News Parade" series (Castle). It has also encouraged the distribution of a fine series of British teaching films by Gutlohn, Bell & Howell, Lenauer Films, and others.

The rapid growth of the market for sound films usable in the school-

room has attracted the interest of theatrical producers. Thus, Pathé has made available such pictures as "Old Faithful Speaks"—giving the actual sounds as well as sights of Yellowstone National Park—"Craters of the Moon," and "City of Proud Memories." Columbia has released a series of ten "Voice of Experience" radio-theater reels. Paramount offered a series of "exploitation shorts" based on current features such as "The Plainsman," "Maid of Salem," and others. These excellent one- and two-reel educational releases were edited by Mr. Ralph Jester, with the collaboration of active visual instructionalists of southern California. For a year, several of these were available to schools on an outright purchase basis and over a hundred prints of "Spirit of the Plains" were placed with visual-instruction centers. The films were then withdrawn, presumably in the interest of making uniform the policy of the producer toward school film distribution. It is anticipated that the sale or long-term lease of this series will soon be resumed.

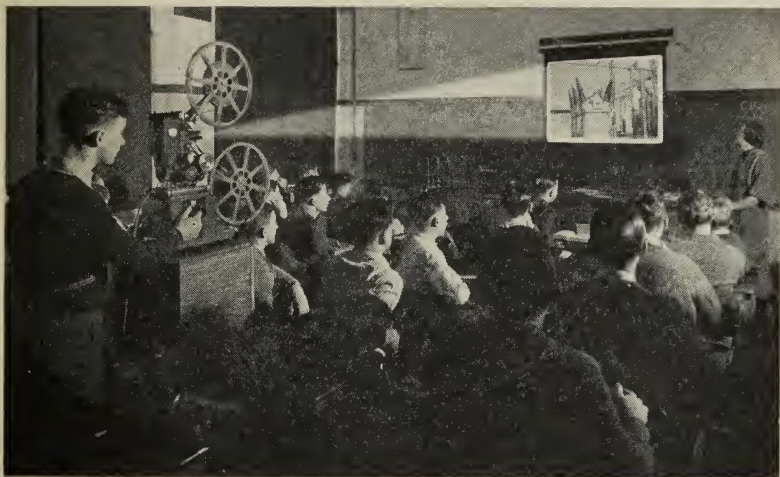
Several major Hollywood producers have released their features and short subjects for nontheatrical distribution, through such national distributors as Bell & Howell, Films, Inc., Gutlohn, and Kodascope. These producers include Universal, R.K.O., Paramount, Grand National, and Gaumont-British, with isolated films from others. In most cases, the 16 mm. distributors are charged with the responsibility for avoiding conflict with theatrical interests, but in some instances the major producer exercises direct regulation of the uses to which 16 mm. prints of his films may be put.

The problem of avoiding competition with near-by motion-picture theaters should not be insurmountable, if educators approach the use of films in the school from a teaching rather than purely show-business viewpoint. A year after its theatrical release, the average film has very little further box-office value, and it could well be made available henceforth for school use, if suitable for educational purposes. There is little chance of competition with the theater, particularly since the pictures most desirable for school use seldom rank highest in box-office returns, according to Dr. William Lewin's report at the 1938 N.E.A. meeting.

Increasing recognition is being given the use of the feature film in the school for other than purely entertainment purposes. One film-rental library selects and groups its feature films for their historical, ethnographic, or human-relations interest, for occupational or literary background, and for motion-picture appreciation study. Self-censorship is rigorously practiced by the serious 16 mm. film library that caters to school business, and objectionable sections of otherwise good

films are deleted from prints intended for school and home use.

The availability of 16 mm. sound films for school-auditorium use permits better control of photoplay appreciation study, now widely



*Photo Courtesy Ampro Corporation*

#### **Student Operating Motion-Picture Projector in Class**

prevalent in junior and senior high schools. A large percentage of pupils see a recommended film, under identical school conditions, and standards of taste and technique may be objectively discussed without any chance of a local theater man complaining that the school was "knocking" his shows. At the same time, the attendance of worthwhile pictures at near-by theaters can actually be encouraged, as a result of the study of selected films of slightly older vintage, but of more or less permanent worth, in the school auditorium. The relationship of school and theater in this connection is parallel to that of school and periodical publisher. The English classes' study and analysis of selected short stories, poems, and novels certainly does not hurt the magazine publisher—on the contrary, it is his sole guarantee of future market for good writing. Forward-looking motion-picture people are beginning to take the same attitude.

Interesting "discussion outlines" are available for use with feature films of solid educational worth. Discussion is begun perhaps weeks in advance of the play date, many subject-matter groups at various



age levels engage in this advance consideration of questions to be raised when the scheduled film is shown. The picture itself furnishes a common emotional experience for all the pupils and teachers of the entire school. After it has been viewed, projects and school journeys are planned and further discussion is held, with the teacher guiding and adapting whatever discussion serves subject-matter needs. This method helps break down rigid walls between subject-matter fields, for a pupil may have been called upon to think about and discuss a given film from half-a-dozen or more distinct angles, not the least important of which is the acquisition of a good emotional attitude toward the problems of conduct or human relations, raised in every well-made motion picture. This emotional contribution of the motion picture is an utterly unique gift placed at the service of the school. It is still so new that no very clear evaluation of its possibilities has been attempted, yet this phase is coming in for ever more attention in current visual-instruction meetings.

The human-relations angle is being studied thoroughly by a group of progressive educators, headed by Dr. Alice V. Keliher. A project that is being financed jointly by Rockefeller funds and by the Hays Organization, provides for the cutting of theatrical features into short subjects, posing but not solving problems in human relations. These short films are then discussed freely in class, the utmost freedom of self-expression by the students being encouraged. So fruitful has been this discussion that it has been made a regular radio broadcast, one of the very few unrehearsed programs to go out over the air. The use of these films is at present confined strictly to human relations groups in twenty selected experimental schools, but it is hoped that these restrictions will be modified on these excellent pictures, and on the earlier "Secrets of Success" series, of similar type, edited by Dr. Howard LeSeurd.

The great need for a clearinghouse of information concerning all types of films suitable for school use has been recognized for many years. The Association of School Film Libraries, Inc., 9 Rockefeller Plaza, Radio City, New York, was established three years ago for this purpose. The Association prepares lists of available films, encourages producers to provide needed types of films, and assists distribution centers in the selection of desirable educational subjects for use in their service areas.

One of the most complete assortments of 16 mm. sound motion pictures now available is offered to schools by Teaching Film Custodians, Inc., 25 West 43rd Street, New York City. The films offered were

selected from approximately 15,000 short subjects, originally produced for theatrical use. The selections were made by an Advisory Committee on the Use of Motion Pictures in Education. The chairman of the Committee is Mark A. May, Director of the Institute of Human Relations, Yale University, who is assisted by the following committee members:

Frederick H. Bair, Superintendent of Schools, Bronxville, N. Y.  
Isaiah Bowman, President of the John Hopkins University  
Karl T. Compton, President of Massachusetts Institute of Technology  
Edmund E. Day, President of Cornell University  
Royal B. Farnum, Exec. Vice-President, Rhode Island School of Design  
Willard E. Givens, Executive Secretary of the N.E.A.  
Jay B. Nash, Professor of Education, New York University

The films included in the catalog of hundreds of subjects were evaluated and classified by classroom teachers in various sections of the United States. Each film is available on short or long term lease to schools or school systems which will agree to use the pictures for teaching purposes only.

The problem of quantity—whether there is enough film to justify the purchase of a 16 mm. sound projector—has been overcome. One library alone offers a sufficiently large selection of titles to permit the running of a feature and three shorts every week for five years without “repeats.” Most of this film is selected originally on the basis of school fitness, since the schools at present constitute the largest group outlet for this type of service. Quality of available material is not uniformly high, but improvement is to be noted, and there is already discernible a trend to drop out the less desirable listings. This improvement in quality may be expected to increase as both supply and demand grow.

A number of schools and systems, including leaders in visual education, such as in Pittsburgh, are using sound films to meet other than teaching situations. In one case, undesirable school surroundings are minimized by motion pictures shown at lunch recess, the school board paying for all rentals. In another case, auditorium noonday movies take the strain off an overcrowded lunchroom. Sometimes such films are free, sometimes subject to a small admission charge to cover rentals. Sometimes they are just clean enter-

tainment, sometimes reels selected for additional use the same day for classroom work.

The CCC represents an educational endeavor in which motion pictures are particularly effective aids. The entertainment problem represents an important side of the big cultural job confronting camp commanders and educational advisers. The size and restricted character of this audience has resulted in letting down many bars to the circulation of 16 mm. films in the camps, and has resulted in the purchase of hundreds of projectors. This work borders on the extensive adult education program fostered by other Government agencies, in which the motion picture is also playing an increasing role.

The most significant development in the use of sound motion pictures for training purposes has been left to the last of this discussion. It exemplifies the great recognition which has been given to the potential instructional value of motion pictures.

The war in which the majority of the nations of the world are now involved is a mechanized war. Airplanes, tanks, guns, and ships must be produced in greater quantities than ever before. Workmen must be trained to produce these machines for war and this training must be rapid. The motion picture, which has proved its value in training for less destructive purposes, has been chosen as an important aid to this gigantic training program. The plan is explained clearly in the announcement of the U. S. Commissioner of Education, quoted below:

“Federal Security Agency  
U. S. Office of Education  
Washington

#### “New Visual Aids for Defense Training

“The task of training the workers needed for our defense industry is a staggering one of unprecedented proportions. Improved methods and procedures have had to be developed to meet the problem. We may expect the task to become more difficult as new sources of labor supply are tapped.

“The U. S. Office of Education, in order to assist the instructors charged with the training of workers for defense industries, has developed a series of fifty motion pictures. These motion pictures have been specially planned and designed by experienced shop instructors to provide the greatest possible help to instructors training defense workers.

“As it was imperative to get the pictures produced and made available at the earliest possible moment, the work of producing them was distributed among eight companies engaged in the production of commercial motion pictures. Later

a separate contract was awarded by the Procurement Division of the Treasury Department for the U. S. Office of Education to Castle Films, Incorporated, covering the making of prints, their sale and distribution throughout the United States.

"These training motion pictures were planned and developed by a committee of the Office of Education. This Committee was composed of the following men: C. F. Klinefelter, Chairman; W. M. Arnold, J. R. Coxen, R. W. Hambrook, L. S. Hawkins, Allen W. Horton, E. L. Kirchner, W. P. Loomis, C. E. Rakestraw, S. M. Ransopher, Tom Watson; F. E. Brooker, Director, Visual Aids; and J. W. Barritt, Technical Consultant.

"In order that the production of each motion picture might have the direct supervision necessary for technical accuracy and teaching effectiveness, a group of competent individuals was selected by the State leaders of vocational education in the States of Connecticut, Massachusetts, New York, New Jersey, Pennsylvania, Michigan, Minnesota, Missouri, and Kansas to assist in the production of specific films that were produced in the above States. Many of the leaders of training, both in industry and in the schools, have served on these State committees and their contribution has done much to insure the technical accuracy and the teaching soundness of these training motion pictures.

"These films are designed to show actual demonstrations of specific jobs on specific machines by expert operators; to emphasize such points as safety, the importance of blueprints, the need for cleanliness and good housekeeping, and the necessity for checking lubrication; to explain the basic principles of correct machine operations as they apply to specific jobs; and to use the motion-picture techniques of slow motion, animation, and magnified views to assist instructors in overcoming some of the instructional difficulties of the subjects covered. It is hoped that the use of these motion pictures with trainees in defense work will assist the instructors in developing an understanding of the terms used, the technical knowledge required, the basic principles involved, the correct order of procedures; in developing an appreciation of good craftsmanship and in developing correct and safe habits of work.

J. W. Studebaker

U. S. Commissioner of Education."

The following is a list of the Machine Shop Work subjects which have been produced under the direction of the U. S. Office of Education and the number of subject pictures in each classification or operation:

<i>Classification</i>	<i>Number of Subjects</i>
The Milling Machine	5
Engine Lathe	7
Precision Measurement	5
Vertical Boring	3
Radial Drill	2
Vertical Drill	2
Shaper	3



Shipbuilding	10
Centering and Layout	1
Bench Work	7
Action of Single Point Cutting Tools	2
Sensitive Drill	1

The subjects vary in length from one to three reels each and are available to schools and industry at print cost.

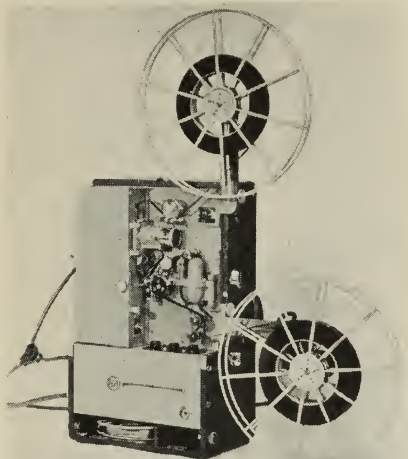
**Types of Sound Productions.** The earlier educational sound films were silent films accompanied by sound which was recorded on a disc. This was known as the "Vitaphone process" and it has been superseded in both the theatrical and educational fields by sound-on-film recording. In the case of 35 mm. sound-on-film productions, the sound is recorded along the edge of the film, using a narrow strip of space between the picture and the line of sprocket holes on one side of the film. This type of sound recording has developed to the point where it is extremely accurate in reproduction. The new ultra violet-ray recording process developed by RCA has increased the range of accurate recording and reproduction to the point where it is now possible to record and reproduce almost any sound which can be detected by the human ear.

Similarly, the first 16 mm. synchronized sound subjects were of the sound-on-disc types; not entirely satisfactory because of the difficulty of obtaining absolute synchronization of sound and picture. It was believed by many that it would be impossible to produce a satisfactory recording of sound on 16 mm. film. There were two problems to be solved. One was the problem of securing sufficient horizontal space to permit the use of a sound track and the other was the problem of reducing the sound to the point where the normal recording on 1000 feet of 35 mm. sound track could be reduced to the 400-foot length of one reel of 16 mm. film. These problems have not been solved to the point where 16 mm. recording and reproduction of sound cover a range as wide as that accomplished with 35 mm. On the other hand, the developments have reached the point where 16 mm. sound film recording and reproduction cover the principal range of normal sounds. Accordingly, the 16-mm.-sound-on-film equipment has replaced the sound-on-disc, and its reproducing equipment.

The projection equipment for the use of 16 mm. sound films is necessarily more expensive than silent projection equipment. The projectors range in price from \$275 to \$1500, including projector, amplifier, speaker, and other accessory equipment required for operation. All the usual 16 mm. projectors are portable, but any equip-

ment which is expected to give the best service should not be moved or shipped any more than is absolutely necessary, inasmuch as there is always danger of damage through handling.

The 16 mm. sound projectors mentioned above are available with illumination units which range in power from 750-watt to 1000-watt incandescent lamps. In addition, some of the more recent projectors offered to the school and industrial market are equipped to use either



*Photo Courtesy RCA  
Manufacturing Co., Inc.*

#### **16 mm. Sound Motion-Picture Projector**

the high-powered incandescent lamps or low-intensity arc lamps. It is believed by some that these more powerful projectors may be used to a considerable extent in the future by small theaters which do not operate continuously and must keep their operating cost at a minimum in order to realize a profit.

The selection of a 16 mm. sound motion-picture projector should be based upon the use planned for the equipment. If the projector is to be used in classrooms only, any of the standard portable units will be satisfactory. These same projectors will provide adequate picture quality and sound amplification for a small auditorium. Where the projection distance is of reasonable length and the auditorium is rather large, adequate sound may be secured by using added amplification and speakers. Representatives of the manufacturers of this equipment can usually recommend the most suitable type of projector, and their recommendations should be carefully considered.

The operation of the sound equipment is a little more complicated than that of the projector for silent films. However, the sound projectors have been so simplified in operation that any person who is at all mechanically inclined can operate the equipment under ordinary conditions. The earlier projectors were built to operate on alternating current only, but many of the more recently produced equipments operate on either alternating or direct current.

The majority of the current models of 16 mm. sound motion-picture projectors, in addition to reproducing pictures and sound, are equipped for the use of a microphone to permit amplification of speech. Provision is made, also, for attaching a record player to provide background music or to use the projector only for the reproduction of recorded music and speech. It is possible to arrange several uses for the one basic projector unit, but usually desirable to secure separate public address and record reproducing equipment if these uses are frequent. Separate units are more versatile and provide multiple service which cannot be obtained with a single equipment.

The recent books by Colonel Devereaux\*, Dr. Brunstetter,\*\* and Dr. Arnsperger\*\*\* so adequately present the subject of sound motion pictures for educational purposes that it seems inadvisable to attempt a similar discussion here.

It does seem desirable, however, to include the following concise and condensed suggestions for using instructional sound films, prepared by Dr. V. C. Arnsperger, Vice-President of Erpi Classroom Films, Inc.

### *Purposes for Which the Films Have Been Used*

"The Erpi instructional sound films have been prepared to make available to teachers and pupils types of study materials and learning experiences which cannot otherwise be presented through the media of other devices and methods of instruction. Therefore, it is essential that teachers consider using the films as a definite part of classroom procedure, and not as a novelty or entertainment presentation. The films have been used successfully for: (1) Introducing a new unit of study; (2) Directly aiding the teacher in overcoming the restrictions of the

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\*Devereaux, F. L., *The Educational Talking Picture*, University of Chicago Press, 1933.

\*\*Brunstetter, M. R., *How to Use the Educational Sound Film*, University of Chicago Press, 1936.

\*\*\*Arnsperger, V. C., *Sound Pictures As Teaching Aids*, Bureau of Publications, Teachers College, Columbia University, 1933.

human senses and the limitations of space and time; (3) Enriching or extending a unit of instruction by opening up related areas for the pupil's investigation; (4) Summarizing or reviewing a given unit's work. All four of these values can be realized if the film showings are properly integrated with readings, discussions, and other classroom study activities.

### *Planning the Use of the Film*

The teacher will wish to become thoroughly familiar with the film to be shown. He should preview the picture to note various types of audio-visual learning cues of local interest and importance. The teacher's manual accompanying the film is helpful in planning a unit's work. It suggests interesting projects in connection with the use of the film, and provides a convenient source of reference for the subject matter content of the unit. If a lesson outline is made, each showing of the film may be indicated at suitable points, together with the functions the film is to serve and the sequences which are to be stressed. The many learning cues in the film provide the teacher with innumerable opportunities to vitalize learning projects.

### *Introducing the Film in the Lesson*

"The way in which the teacher introduces the sound picture is especially important because it sets the perspective from which the students see and hear the film. The teacher may refer to former projects or topics which have direct bearing upon the new material which the film is to present. He may raise questions which will be answered in whole or in part by the picture. Sometimes it may be desirable to explain new words appearing in the film, or technical photographic processes employed. Attention may be called to certain scenes or sequences which will be shown in the picture. Still another way of focusing attention upon specific elements is that of making advance assignments of activities growing out of the film experience. In other words, it is essential that the purposes for studying the film are clearly defined in the minds of the students before the initial and subsequent showings.

### *Showing the Film*

"After the uninterrupted presentation which is desirable in the first showing, other procedures may be employed. In later showings of the film teachers sometimes find it advantageous to stop the projection for brief comments or discussion. It is possible also to utilize only a few sequences, rather than the entire film, as the basis for the day's lesson.



Another variation which teachers sometimes use is that of shutting off the sound and giving a special commentary to accompany the pictures shown. This procedure may also be used in reviewing, with students describing or commenting upon the picture.

### *Teaching After the Film Showing*

"A good film stimulates the student to do something about what he has observed—to exchange viewpoints, to verify, to read and study, to learn more about the new ideas which the picture has given him. In the discussion which follows the film showing, the teacher has an opportunity to discover these interests and guide them along profitable lines.

"The general purposes of the discussion are to bring to a focus what the students have derived from the picture, and to organize the succeeding study activities. The teacher will find individual interests to encourage, and questions which will lead naturally into reading, and various projects.

### *Repeated Uses of the Film*

"A sound film which is an integral part of the unit being studied should be shown several times. It is very important, however, that for each showing the students have a definite purpose for seeing the picture. The second showing will answer many questions which have been raised, and will add considerably to the students' understanding of the subject matter they have been studying. Toward the end of the unit, a final showing serves as an excellent device for review and summarizations."

Those who are planning to make extensive use of sound motion pictures should become familiar with the various books on the subject, as well as with the numerous articles appearing in school journals during the past two or three years. These books and articles contain suggestions which will be helpful to the teacher, principal, or administrator who is using or is planning to use sound motion pictures. A few of the more prominent publications are listed in the directory of sources, which follows the text of this HANDBOOK.

### *Television*

Television, the simultaneous broadcasting and reception of pictured action and sound, combines many of the features of radio, the drama,

and the motion picture. It differs from the sound motion picture principally in its ability to present the action or event as it happens. Thus events of current interest can be seen and heard at the television receiver as they occur, and often more clearly than if one were present at the actual happening.

The rapid developments in television broadcasting and reception since regular service was inaugurated by NBC at the opening of the New York World's Fair in May, 1939, have made this new electronic art the center of attention and speculation. It is now possible, at the flick of a switch, to sit at home and see and hear a variety of programs. A glance at a few of the types of television programs put on the air by NBC recently will indicate the wide range of service available:

Dramatic Productions:

The Passing of the Third Floor Back  
Julius Caesar  
The Gorilla  
Three Men on a Horse  
My Heart's in the Highlands  
The Perfect Alibi  
The Long Christmas Dinner  
Little Women  
Jane Eyre  
Treasure Island

News and Special Events:

King and Queen of England  
K of C Track Meet  
Basketball National Invitation Tournament  
Football, Fordham vs. Waynesburg  
Baseball, Fordham vs. Columbia  
Hockey, Americans vs. Detroit  
Boxing, Golden Gloves Finals  
Professional Wrestling  
Harvest Moon Ball  
Secretary Hull  
Haskell Mounted Indians  
Life Saving Demonstration  
St. Patrick's Day Parade  
Wings of a Nation  
News Broadcasts

## Artists, Actors, and Personalities:

Wally Butterworth  
Capt. "Bob" Bartlett  
Mary Brian  
Richard Bonelli  
Helen Claire  
Bruna Castagna  
General Drum, U.S.A.  
Jane Froman  
Ham Fisher  
Rube Goldberg  
Hanya Holm  
John B. Kennedy  
Bert Lytell  
Grace MacDonald  
Carmen Miranda  
Lucy Monroe  
Mordkin Ballet  
Paulist Choristers  
The Southernaires  
Dr. Vilhjalmar Stefansson  
Alison Skipworth  
Dinah Shore  
Helen Twelvetrees  
Gene Tunney  
Ethel Waters  
Sir Hubert Wilkins  
Linton Wells  
Westminster Choir  
Fred Waring

In addition, there have been broadcasts of numerous motion pictures of outstanding merit in all fields, augmented by special acts, music, and current events.

These programs have been intended for home reception. In addition, there has been developed a new type of apparatus for the projection of television in a theater to accommodate large audiences. It is now possible to project such pictures to a width of twenty feet and it seems likely the picture can be increased to any reasonable size. It may not be long, therefore, until projected television reception to meet classroom requirements will be thoroughly practical, within the range of transmitting equipment.

Television reception, similar to ultra high frequency and frequency modulation in radio, is limited, roughly, to the horizon surrounding the transmitting antenna. Normally, the range of good reception is



*Photo Courtesy National Broadcasting Co.*

#### **Television Set, Ready to Broadcast**

limited to a circular area with a radius of forty to fifty miles, but good reception has been experienced at greater distances.

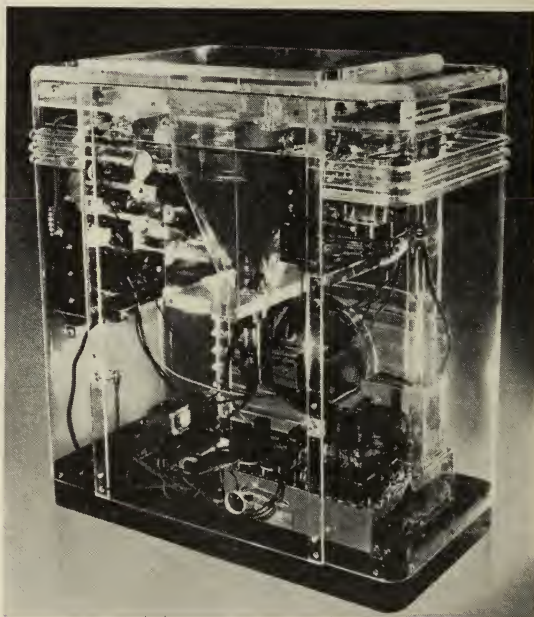
The future possibilities of television as an aid to instruction is most promising. It is not expected, however, that its use will retard or replace the use of motion pictures, radio programs, or any of the other valuable teaching aids. Instead, it should supplement classroom instruction by making available types of programs which may be presented more effectively through this new medium.

The majority of the audio-visual aids now in common use among schools were first utilized extensively in industry and later adopted by schools. This has caused a lag between general use in industry and widespread application to the improvement of classroom instruction. In order to avoid or shorten this lag in the school use of television, the National Education Association has appointed a Television Committee, which is working under the chairmanship of J. Raymond Hutchinson, Thomas Jefferson High School, Elizabeth, N. J.

The objectives and purposes of this committee, as stated by its Chairman in the December, 1941, issue of *The Nation's Schools*, are as follows:



1. To advance the knowledge and the practical and efficient use of television in the field of education.



*Courtesy RCA Manufacturing Co., Inc.*

#### **Glass-Enclosed Television Receiver**

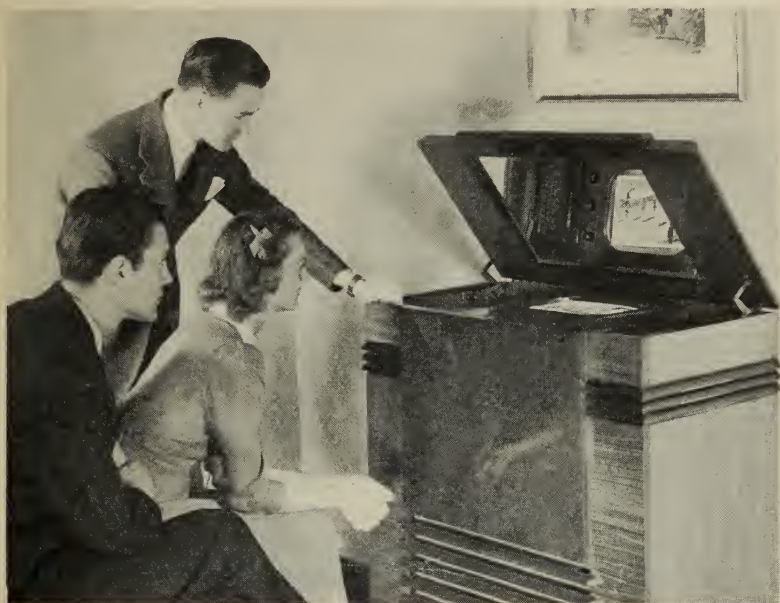
2. To conduct observation, study, and research that will aid in establishing television as an educational medium in the home, the school, the church, and community centers.

3. To assist individuals and groups to establish centers for study and observation of telecasts by providing information and assistance through personnel, publicity, bibliographical materials, collaboration, consultation, and moral support.

4. To make the results of our own researches and studies, both those in which we have assisted and those submitted to us, available to interested groups through consultation, through publication of reports, monographs, and books, and through releases of pertinent information to educational magazines and other publications.

5. To organize, sponsor, and conduct lectures, discussion groups, and programs in television.

6. To keep abreast of the advance of television and its allied faculties, of facsimile and frequency modulation and other developments as they may be made here and abroad.



*Photo Courtesy RCA Manufacturing Co., Inc.*

### **A Television Receiver**

7. To disseminate information on the problems of television with their solutions, through the co-operation of educators with the established agencies of government and the industry, so that the benefits of television can be (a) made more readily available to the entire nation; (b) established on the most effective principles of use and service; and (c) continued on the established American principle of making the best programs available to the user with no direct fee or tax.

Those who may be interested in the problems of using television for instructional purposes, or who may be willing to co-operate with the Committee, should write to Mr. Hutchinson. His committee is serving as a clearinghouse for television information.

In the meantime, those in educational work who may be hesitating to secure radio or motion-picture equipment for school use for fear of obsolescence due to rapid television developments, may dismiss those

fears and proceed with reasonable assurance that any up-to-date equipment installed this year or next, or during the next several years, will be extremely useful for many years to come. The development of the motion picture and its subsequent use among schools has not caused a decrease in the use of still pictures in education. The rapidly increasing use of radio in education has not caused a decrease in the use of phonograph records. On the contrary, each new development seems to validate the potential values of earlier developments and cause those older types of audio-visual aids to become more important in the classroom. Similarly, it is expected that the development of television, however rapid or delayed it may be, will but serve to increase the educational importance and use of all types of audio-visual aids among schools.

### *Facsimile*

Facsimile is not a new art, but recent developments have brought it into prominence as a potential teaching tool of considerable promise. One of the first patents was recorded in 1842 by Alexander Bain. However, it is new as far as the general public is concerned, and as far as what we mean today when we mention facsimile.

Facsimile is the replica, or the reproduction, of an original. A facsimile reproduction of a legal document is legal—a signed check transmitted by facsimile is legal. Facsimile was first used in a slightly different form commercially, known as radio photo. Then it progressed into the wire-photo service—the pictures were distributed by telephone methods. Those systems are basically facsimile systems, but the equipment was designed for further reproduction. The facsimile of today is a broadcast receiver and is not designed for reproduction. It is a final picture or product. It is a very interesting device and, like a great many other scientific devices, its actual value will depend upon the ingenuity of the various groups using it.

Technically, the basic system consists of sending and receiving instruments. The sending equipment utilizes the photo-electric eye to scan in an orderly fashion all the line elements of a page of material placed in the scanning machine. As the scanner passes over a given point at a given time it receives more or less reflected light, depending on whether the subject matter is black or shades of gray or white. It transfers these light variations into electrical impulses which are amplified by conventional amplifiers and passed to a transmitter similar to those used for transmission of voice or music.

At the receiving point, some form of printing mechanism is necessary which screens the receiving paper in exact juxtaposition with the sending point. This reconstructs a large number of dots or lines across the page, in exactly the same relative position and in the same density;



*Photo Courtesy RCA Manufacturing Co., Inc.*

#### **Facsimile Receiver**

in a sense halftoning or screening the picture. One of the major practical difficulties is the fact that whereas these commercial units have skilled engineers operating the receivers, the home receiver has to work automatically without any processing on the part of the home owner. This must be simplified and made as foolproof as possible, and there have been important strides in that direction during the past year.

The sending equipment, called a scanner, is being sold to various broadcasting stations which are experimenting with it at present, and the Radio Commission to date has issued only experimental authorizations. This equipment cannot be used for commercial purposes. The majority of these are newspaper-owned.

The sending equipment can be used on any wave length transmitter in broadcasting. That automatically places it into two wave lengths: the normal broadcasting band, and the experimental band—ultra-high frequency. Technically, the major difference in those two is that fac-



simile broadcasters are allowed by the Commission to broadcast on the normal broadcast band only in the early morning hours, while all ultra-high frequency stations are allowed to broadcast facsimile at any time of the day or night. Early morning hours are effective over a much greater distance.



*Photo Courtesy RCA Manufacturing Co., Inc.*

#### **A Facsimile Receiver in Operation**

The standard bands would make facsimile more suitable to rural coverage. Ultra-high frequency, or u.h.f., as it is usually designated, would be used primarily for urban coverage. The regulations governing an experimental broadcasting station on standard bands require the station to buy the scanner and a minimum of fifty receivers which are distributed among the homes and in public places. On u.h.f., there are no minimum requirements on the number of receivers, but a minimum of ten to twenty is necessary for worth-while results. The broadcasting stations themselves do not know how facsimile will be used eventually, and neither do the newspapers. Many feel that it will be confined to a bulletin or flash type of news giving a much more highly edited copy than the conventional longer story which appears in the newspaper.

Some editors are looking forward to embarking on a new type of news coverage which liberal thinkers in the newspaper industry are advocating. This would be more of a classified arrangement of news in briefer, more highly edited form. It remains to be seen just how



*Photo Courtesy RCA Manufacturing Co., Inc.*

### **Placing Printed Material in a Facsimile Scanner**

this tool can be used in education. The combination of sight (visual) and sound media should form a highly effective medium for use in educational work as well as in normal broadcasting work. Various suggestions have been made. Some stations feel that simultaneous transmission of a program on their normal sound panel could be worked out in connection with a cooking school. As the young lady describes procedure and mentions ingredients, she could refer to the facsimile for the recipe. Fashion talks could be given in the same way. There are other possibilities of the same type which might be applied to educational work.

The paper on which the image is reproduced is eight and one-half inches wide, coming out at the rate of three feet per hour. It is tech-

nically possible to roll the paper out much faster than that, but the cost makes it impractical at present.

The scanner, which has been mentioned, costs approximately \$3000. Standard band receivers are \$260 each; the u.h.f., \$240 each. In the future, the two bands may be combined in one receiver to make it more salable—and this may be a sound, and facsimile receiver. The upkeep is nominal and the principal depreciation would be obsolescence.

The first experiment with the use of facsimile in a school system was conducted by the Radio Department of the Cleveland City Schools in February and March of 1939. Five schools were equipped with receivers and the scanner operated through the u.h.f. transmitter of the Board of Education. The Superintendent's Bulletin was sent to each school, by facsimile, rather than through the mail. News summaries were broadcast, as well as the high school newspaper. Instructional guides were sent to the various schools and were received clearly. The operation was highly satisfactory and created considerable interest among those who saw the demonstrations. It is much too early to make any predictions concerning the probable future use of facsimile among schools. The manufacturers have developed a new means of communication, will further perfect it, and its future in schools will be determined by the school executives and teachers who employ this new device.

## V

### Organizing the Audio-Visual Service

**R**ECENT surveys of audio-visual aids in use among schools have produced interesting information. It has been the common practice among schools and school systems to centralize the visual instruction service, that is, to make some person or committee responsible for procuring and planning the use of appropriate visual aids to instruction. These individuals and groups are asked to co-ordinate the requirements of various teachers, departments, and schools, and are often asked to include in their plans some provision for the training of teachers in the use of visual aids.

After several years of experimentation schools and school systems have come to realize that visual instruction plans, to be effective, must take into consideration the curricula of the schools concerned, and the specific plans and needs of individual teachers. Using visual aids without this consideration will result in a waste of time, money, and teaching effort. Most schools using visual instruction aids, therefore, are giving time and attention to visual instruction planning.

This advance in the administration of the visual instruction program among schools has laid a good foundation for the intelligent use and administration of sound and audio-visual aids to learning. Schools are purchasing equipment and supplies to meet the requirements of a planned instructional program. Also, it seems a general practice to utilize the organized visual-instruction department or program—an experienced person or group—for the co-ordination of the general audio-visual program. Perhaps the natural link between sound and silent educational films has brought this about, but many visual-instruction departments among schools have been extended to include direction of the use of radio programs, sound amplifying equipment, sound-recording equipment, phonograph records, and the equipment for reproducing and distributing sound. Here again, the principal advantage is that of co-ordinating plans to avoid waste of time, money, and teaching effort.

#### *General Problems of the School Unit*

The problems of organizing and utilizing the audio-visual program are many, but each may be solved if given appropriate consideration. Many schools find it difficult to secure adequate funds with which to



inaugurate and maintain an audio-visual program. The importance of this problem seems to warrant its consideration on a par with the problem of securing funds for salaries, buildings, coal, library supplies, or textbooks. It is true that it is sometimes difficult to convince school officials of the need of new and hitherto untried equipment.

The best argument for securing needed funds to conduct an adequate audio-visual program is to demonstrate its effectiveness in a small way, and use the results as a basis for extending the service to other classes or school units. There is no school which cannot make some use of school journeys, exhibits, specimens, photographs, phonograph records, stereographs, and other simple but effective teaching tools. Many of these good aids are available at little or no cost. Expansion of this small start to include filmstrips, glass slides, motion pictures, radio, school radio-sound equipment, and other effective aids should be a logical procedure, fostered by favorable results from the use of these simpler and less expensive aids.

Training teachers to use these teaching aids properly, is important. There are certain audio-visual aids, such as motion-picture programs of general interest, radio programs of world importance, materials for teaching safety and health, and aids for the teaching of music appreciation which may be applied to an entire school or school system with highly favorable results. On the other hand, the more extensive and usually more effective use of audio-visual aids lies in classroom teaching aids which have been selected to increase the rate of learning in certain subjects or to broaden knowledge of those subjects. This means that teachers in service as well as those in training must receive advice and actual instruction in applying aids to the teaching of the subjects assigned to them.

Teachers in training in many of the teacher-training institutions are given opportunities to learn the techniques of using visual aids. Some are given training in the use of phonograph records, radio, and audio-visual aids. More than 200 institutions are offering visual instruction courses regularly and many others demonstrate the use of audio-visual aids in teaching science, history, music, speech, language, geography, vocational guidance, health, physical training, commercial, and other subjects. Some institutions require evidence of such training before graduation.

Training teachers in service is more difficult. A number of solutions have been offered. Some of the larger school systems have organized training courses which are attended by employed teachers. Extension courses have been made available through leading universities and teachers' colleges. Visual instruction directors have organized special

institutes and demonstrations of the use of audio-visual aids and books and pamphlets in the audio-visual field have been made available for reference use. District, county, state, and national meetings of teachers usually include demonstrations of teaching aids and the larger group meetings include exhibits of the most recent developments. Summer training courses in the use of audio-visual aids are offered by many institutions. All these activities aid the teacher in service but there yet remains a need for more extensive group demonstrations and more intensive training of the individual teacher. This need further justifies the desirability of delegating the responsibility for the audio-visual program of the school or school system to one or more persons who will make certain that teachers receive the necessary assistance and training.

### ***Using Audio-Visual Aids in the Classroom***

The possible applications of audio-visual aids to classroom procedure are unlimited. This does not mean that every school or room should have an elaborate set of equipment, but that every teacher should be able to make appropriate use of any readily accessible audio-visual aids. The following discussion will mention a few of the more prominent aids. However, there are many variations of these, and additional materials which may be utilized with favorable results.

**In the Primary Grades.** The sand table, paper cutouts, models, pictures, charts, phonograph records, and some forms of projected pictures are especially suitable for use in the primary grades. Number combinations and elementary reading material can be presented in slide form with effective results. A great motivating force may be used in the elementary classroom in permitting the pupils to make pictorial materials to be projected or to be placed on display. The recent development of the nonflammable "Lumarith" as a substitute for glass in making slides provides a type of material which eliminates the danger of broken glass. The use of "Lumarith" makes it easy and entirely safe for small pupils to make their own slides and project them on the screen.

The phonograph record may be used to good advantage from the lowest grades through college and for adult education. There are many recorded songs for children, instrumental studies, rhythm records, singing games, folk dances, etc., which are especially effective in the primary grades. Some of the recently recorded fables and readings will help in the interpretation of stories for children. The recorded story of "Little Black Sambo," with appropriate sound effects, is un-

usually interesting to children, and almost as interesting to adults.

In many instances it has been found advisable to use motion pictures in the lower grades. Motion pictures of children's stories serve well to motivate projects of various kinds and to give a clearer understanding of the stories themselves. Some teachers have used the "Chronicles of America Photoplays" in grades below the level of those who are just beginning the study of history. They have found that these dramatized events in American history are quite intelligible even to first, second, and third grade pupils. The new children's films produced by Erpi Classroom Films and Eastman Teaching Films are used extensively and effectively in the lower grades.

There has been some feeling that the projection of motion pictures before very small children might cause a strain upon the eyesight which would be harmful. Tests have been conducted to determine the effect or fatigue of watching motion pictures, and the majority of those who have reported state that if the pictures are projected properly there is no measurable eyestrain. Of course, a poorly projected picture will strain the eyes of either child or adult.

**In the Intermediate Grades.** There is a much wider range of materials from which selections may be made for use in the intermediate grades. Here again one of the first objectives of the visual instruction program should be that of pupil participation, either directly or by assisting with the preparation of certain materials. Visual aids may be effectively used in elementary composition, both oral and written. There is a great stimulating effect from pictures particularly in arousing interest in subjects somewhat removed from the usual contacts of the pupil.

The pupils in the intermediate grades can prepare much of the material which is needed to illustrate daily work in geography, history, and other subjects. At this age they will be interested in collecting and can be of great assistance to the school in the collection and preparation of materials for the school museum. In addition to materials prepared locally, there are many excellent pictures, stereographs, glass slides, filmstrips, and motion pictures which are especially adapted to the intermediate grades. One of the most noteworthy developments of recent years is the special series of highly illustrated texts prepared by the Keystone View Company.\* Another set of material which is especially helpful has been prepared recently by Photographic History Service.\*\*

\*Keystone View Company, Meadville, Pennsylvania.

\*\*Photographic History Service, P. O. Box 2401, Hollywood, California.

There are various types of sound and audio-visual aids which are particularly good to use in the intermediate grades, such as the more advanced types of phonograph records; particularly those designed for use in early music instruction, or in the teaching of music appreciation. Recorded works of literature, and musical recordings which are correlated with the study of literature, history, or geography, may be used with excellent results in the intermediate grades. Some speech instruction is often given in these grades, making it desirable to use speech-recording equipment for the purpose of encouraging and measuring improvement.

There are also many radio programs which are suitable for intermediate groups.

**In the Secondary Schools.** Probably the greatest quantity of prepared visual aids are available for the use of the secondary schools. There are hundreds of reels of motion pictures, thousands of glass slides, phonograph records, hundreds of filmstrips, prepared sets of mounted pictures, stereographs, and exhibits. Teachers here have a wealth of material at their command.

In addition to fitting pupil-made and commercially prepared visual aids into the work of the high school, the science, geography, and history teachers have many opportunities to prepare their own materials, some of which are more helpful than much of the service available in prepared form. Maps can be traced on glass slides and projected for teaching and checking purposes. A map projected to the blackboard may be seen by everyone in the classroom and may be used as the basis for fixing locations. When it has served its purpose, the only erasure necessary is to turn off the projector. If it should be necessary to identify certain things on the map with chalk, no harm is done to the projected map.

Outline slides of insects, flowers, plants, animals, life cycles, and of almost any other group of subjects may be prepared on glass slides. Typewritten information, questions, etc., may be placed on cellophane slides for projection. These simply constructed aids may be used for identification, study, or testing purposes.

High schools are finding it more and more advisable to depend upon visual aids for assistance in developing special projects. Frequently the work of the school is photographed with a still camera and made into filmstrips or 2" x 2" slides for projection, or is recorded on motion-picture film. Athletic events, commencement exercises, school plays, pageants, and other activities of the school may be recorded and preserved as a running story or history of the institution.



These devices may be used to bring the school closer to the community—always a desirable aim.

In the high school, and in many cases in the junior high school, it is advisable to offer courses in photography so the pupils may have an opportunity to become acquainted with the manipulation of a camera. Perhaps there is no single instrument which will return as much genuine pleasure to the owner as a good camera. Many persons who own cameras do not know how to use them most effectively and time, effort, and film is often wasted, either through improper exposure or improper selection of the subject itself. A course in the fundamentals of photography would be of great value to those persons as well as to all who may be interested in making good use of leisure time. A group of students in a class in photography could handle the major part of the necessary photographic work of the school and could do much to provide suitable illustrations for various school publications. Furthermore, a group of this kind—with proper direction—can make many useful glass slides, filmstrips, 2" x 2" slides in color, and possibly motion pictures for teaching various subjects.

The teaching of high-school groups offers a fine opportunity to make use of all types of sound and audio-visual aids. The sound motion picture has been found to be especially desirable when used properly in high schools. There are many excellent radio programs designed for high-school instruction. The band, orchestra, and music appreciation programs are utilized by high schools more than by any other grade of school. Sound-recording equipment is used in speech and music classes and frequently for the purpose of recording radio programs which are to be used over and over again by certain groups. This same equipment is used to record school productions and a very recent development is the use of recording equipment to make transcriptions of debates which are sent from one school to another and are used in opposition to a debating team of another institution. Many high-school groups are preparing radio scripts and producing radio programs which are broadcast over local stations. The best of these are used by the large broadcasting networks. Again, recording equipment is helpful in checking the preparation of the program itself.

Many school buildings, which have been constructed during the past few years, have included provision for school radio-sound equipment. This is particularly true of high-school buildings, but the same procedure is being followed among elementary schools. The many advantages of such equipment are obvious. One of the greatest advantages is the saving of administrative time when it is necessary to

convey messages from the office of the principal to teachers or students in various classrooms. The school radio-sound equipment offers another advantage in providing an opportunity for high-school students to obtain actual microphone experience. This is particularly valuable since speech is so important in everyday affairs and the microphone is almost an essential piece of equipment for speaking to groups of any size. The same equipment may be used for distribution of recorded



*Photo Courtesy Dr. J. B. McHarg*

#### **A College Lecture Room Equipped with Globes, Maps, Projectors, and Screens**

programs, either phonograph records or transcriptions. The development of music appreciation is made much easier by the use of modern phonograph records and radio-sound equipment which permits the use of the recorded music in any number of selected rooms at the same time. This equipment also reduces the necessity of special assemblies, which in turn avoids waste of time.

**In Colleges and Universities.** Recent trends in certain colleges and universities of the United States indicate that there is a tendency to deviate considerably from the time-honored lecture path. Many instructors depend upon slides, films, and other aids to assist them in creating and maintaining interest in their subjects as well as in presenting that which they desire to have the students retain. Some of the most successful teachers in our outstanding universities use the blackboard, the chart, the exhibit, the slide, and the motion picture regularly in connection with their work. One very popular teacher of sociology uses such a simple article as a wasp's nest to illustrate many of the principles of social organization and co-operation. All such devices have a tendency to develop strong interest and create indelible impressions.

The majority of the motion-picture subjects which were available eight or ten years ago were designed primarily for the junior and senior high-school level. More recently many subjects have been prepared especially for use in college classes, including a liberal supply of technical subjects for advanced and graduate groups. The excellent series of instructional sound films which has been produced by Erpi in co-operation with the University of Chicago is but one example of the trend toward more effective teaching methods in the colleges and universities. Lecturers who come before college groups are finding illustrative materials of various kinds to be extremely helpful. The majority of those traveling lecturers who meet college audiences regularly are using objective illustrations. The lecture which is advertised as being "illustrated" will draw two or three times as great an audience as another lecture of similar quality and importance without the added interest of projected pictures.

Although it is likely that leading high schools are using sound and audio-visual aids more extensively than the average college, it is also likely that the average college is using these aids in a greater variety of ways than the high school. One of the most recent developments among colleges, which is a rather direct result of earlier music appreciation work among elementary schools and later among high schools, is the somewhat widespread attention that is being given to music appreciation. Some colleges have established music libraries which contain books and other publications, but the more important equipment is a very complete collection of phonograph records. These music libraries include in their equipment record-playing devices and listening rooms where students may go to hear the finest of recorded music. In some instances, record albums are available for loan to students very much as books, pamphlets, etc., are provided. This rapidly developing interest in good music among college students has caused the Carnegie Foundation to establish a fund to be used in providing music libraries and facilities for those schools which demonstrate sufficient interest by first building their own libraries of recorded music and providing opportunities for student participation. The interesting phase of this new development is that it is being used by law students, engineers, medical students and those in advanced college courses almost as much as it is used by students in the fine arts departments.

The need for sound-distribution equipment is not as great in colleges as in high schools, although some colleges are finding the equipment to be extremely useful. Sound amplification equipment is almost a necessity in the college auditorium and equipment for recording

sound is becoming standard in speech and music departments as well as in orientation and guidance programs. Many training schools attached to teacher-training institutions make use of all types of audio-visual aids, thus providing the appropriate training for the prospective teacher who will be expected to use these aids as soon as she completes her training and enters the teaching field.

### *Applying Audio-Visual Aids to Special Fields*

It is unnecessary to discuss at length the possible adaptation of different types of visual aids to instruction in the subjects of the school curriculum. Those who are teaching will recognize at once materials which seem to serve best in their specific fields. There is a wealth of material for use in teaching social sciences. Certainly there is no more effective way to give an impression of life in another part of the world than to bring into the classroom exhibits, specimens, models, photographs, slides, motion pictures, and recorded music of the places and peoples of that section. There are many excellent motion pictures of habits and customs among peoples in all parts of the world.

In the linguistic studies, pictures are being used extensively as a foundation for language training. The Society for Visual Education has prepared a series of filmstrips, "An Introduction to Spanish," which relates words to pictures effectively. Many language teachers are finding it much easier to teach fundamental vocabularies by using both individual and projected pictures which are identified by the use of appropriate words. Furthermore, some teachers use these same materials as a testing device. There are some who have a feeling that language studies can be facilitated considerably by preparing animated pictures of root words, endings, prefixes, and so forth, to fix the combinations in the minds of the students. Again the phonograph record assumes an important role by bringing to the classroom, inexpensive illustrations of Spanish, French, Italian, German, Russian, and other languages which are thoroughly accurate in enunciation and pronunciation. The short-wave radio-receiving sets also make it possible for language teachers to bring all types of foreign programs into the classroom.

There are unlimited possibilities for the use of concrete materials of all types in the fields of science, including biological, physical, and general science. Perhaps the majority of the teachers in these fields have been using some forms of visual aids regularly for the past several years. However, the newly developed microscopic, animated, stop-motion, and slow-motion pictures of life forms in their natural sur-



roundings and normal activities can give to the class clearer and more accurate impressions than can be obtained in any other way. The earlier discussion of the motion picture will provide numerous other suggestions as to the application of this valuable tool to the field of science. The "Have You Heard" series of radio programs presented by the Office of Education and "The World Is Yours" series presented by that office in co-operation with the Smithsonian Institution are fine examples of scientific information presented interestingly over the radio. Some of these, and other scientific programs are now available on phonograph records or transcriptions, which will increase and prolong their usefulness among schools.

In the field of fine arts there has been a gradual but slower development of materials. Collections of slides showing different techniques in drawing and painting as well as slides of the famous artists of history, and their works, are used extensively. The Metropolitan Museum of Art in New York City has prepared many interesting motion pictures of various parts of the museum as well as pictures of the techniques used in making pottery and in etching, carving, and painting. These films have been found to be of great value in developing the art program.

The field of mathematics has received little attention among the producers of visual aids of various kinds. Of course various models have been used for number combinations and for advanced work in geometry and trigonometry, but there are only a few slides and motion pictures belonging or relating to the field of mathematics. There have been some plans laid for the production of such subjects, and it is expected that suitable materials will be available in the near future. However, many teachers of mathematics have found flash cards, number combination slides, and other visual aids to be valuable both for routine teaching and for review or testing. One of the most interesting recent developments is a series of stereographs for use in teaching solid geometry.

Constructive English and literature may be greatly enhanced by the introduction of pictures of various kinds. The method of teaching literature by dissection is finding itself discarded in favor of teaching with appropriately selected visual and sound aids. It has been found by closely checking the results of picture showings that when the picture of a novel is shown at a local theater there is a great increase in the calls for that book at the nearest library. This is true among adults, but the same seems to also hold true of students. Students who have an opportunity to see the motion picture "Julius Caesar" are much more interested in the story. Those who have an opportunity to see "A Connecticut Yankee in King Arthur's Court," "The Headless

Horseman," or "David Harum" have a greater appreciation of the authors and their works. Frequently such pictures can be shown as an introduction to a classic and, although some of the pictures are not absolutely true to the story, this fact alone will serve as a powerful motivating influence and will create many interesting discussions among members of the class.

The student who is learning to speak with conviction will be much better able to develop enthusiasm over his subject if he is illustrating his talk with photographs, slides, motion pictures, or other visual aids. A motion picture, a series of slides, or a field trip to a near-by point of interest will provide ample material for many interesting written or oral essays. The experimental work of Dr. William Lewin, of Newark, indicates that the theatrical feature picture should be used more extensively as a basis for constructive English training. Certainly this plan is much to be preferred to the plan of simply telling Johnny or Mary that a theme must be written on some subject and handed to the teacher the next morning.

Phonograph records of the great works of literature, interpreted by the world's outstanding authorities, have been found to be unusually effective for use in classrooms. The radio programs which include similar selections provide excellent interpretations for the student of literature. Radio recordings of great plays and other interpretations of the world's literature provide the finest listening experiences to students in schools of all sizes.

### *Audio-Visual Aids to Extra-Curricular Activities*

There has been some suggestion in earlier discussions of the possibility of using various types of visual aids for extra-curricular work. The field of athletics offers the best opportunity to develop this type of activity, inasmuch as it is usually one of the branches of the school work which can be expected to bring some financial return. Coaches are finding the still and motion picture cameras to be of great value to them in training athletes and are finding many of the professionally produced films to be equally fine.

The different classes and other groups of the school will find many visual aids which can be used in connection with their programs. An International Relations Club, for example, might well use motion pictures and slides as well as mounted pictures of important current activities, peoples of other lands, and the like. A current events group might sponsor the use of newsreels as a part of the work of this interesting field. There are many school enterprises, also, which might make

use of still and motion pictures. Great interest is developed by filming a locally produced play or pageant, for example.

A new development in the use of educational talking pictures has been the preparation of teacher-training subjects by such well-known authorities as Kilpatrick, Bode, Mearns, Allen, and others. These demonstration films can be brought to any classroom or meeting in the United States at a very nominal charge, whereas it would cost hundreds of dollars to secure any one of these outstanding men for a lecture. Furthermore, the illustrations thus presented serve to enhance the values and possibilities of the lecture. The lecturer not only mentions activities of appropriate types but also presents living pictures of those activities as utilized in normal situations.

The administrator in charge of the school will find certain types of visual aids to be particularly helpful in connection with the school publicity program. The Camera Club mentioned earlier in this discussion can be depended upon for illustrations of school activities to be placed on display in prominent public places or to be used as illustrations in publications for the patrons of the school. Local newspapers are always anxious to have good illustrations to accompany stories of school events. People who read the newspapers usually read first those articles which are illustrated. The superintendent or principal will find that motion or still pictures of certain school activities, needed repairs or equipment, as well as other examples of good or bad situations, are helpful in presenting recommendations to a board of education. Without such aids it is necessary, frequently, to waste time in traveling from place to place to see situations which might be photographed easily and the picture transported to any convenient place for showing.

Audio-visual aids offer even greater possibilities in the extra-curricular activities of the school. The production of radio programs to be broadcast over local stations for the entertainment and enlightenment of the community can do a great deal to arouse community interest in the functions of the school. Many patrons of the school, who never visit the buildings or classrooms, can be reached in their homes during those leisure hours when they have more time to think of the work which the schools are accomplishing.

Recorded debates may be sent from school to school where local debaters will be confronted with constructive speeches and somewhat formal rebuttals, which are occasionally more difficult to meet than when the debaters are present. This use of recording and reproducing apparatus provides an opportunity for inter-scholastic debates over a much wider area than could be attempted by sending debate teams

to the schools of the opposing teams.

Sound equipment becomes especially necessary on the athletic field and on the playground where it is desirable to have announcements, instructions, and music reach a large outdoor group. Similar equipment is almost as necessary in large auditoriums, particularly where speech must be carried to all parts of the auditorium in order to be understood clearly.

Band and orchestra work is aided materially by the use of phonograph records of the work of other bands and orchestras playing the selections which the high school band or orchestra is to learn. These records may be used to present patterns or goals to be reached by the band or orchestra. Instantaneous recordings of student performances provide the only objective measure of improvement and serve to stimulate student effort. Radio programs, particularly those in school band work which have been developed by Dr. Joseph E. Maddy of the University of Michigan, are used extensively by school bands throughout the United States. These programs provide for participation and do much to create interest in local band work.

### *Technique of Administration*

The reading references which appear later in this HANDBOOK contain suggestions which will be of assistance to those who are organizing visual instruction programs. Perhaps there is no better way to provide concrete suggestions than to quote one who has been responsible for organizing visual instruction services on a large scale and has accomplished satisfactory results. The following quotation is from a bulletin, "Visual Instruction in Our Schools," prepared by Mr. J. E. Hansen, Chief of the Bureau of Visual Instruction at the University of Wisconsin.

**The Local Administration of the Visual Instruction Program.** "Many of the administrative details connected with visual instruction require a closer study and more time than most teachers can afford from their regular classroom duties. The successful administration of a visual instruction program requires a technical knowledge of the mechanics of picture projection, and acquaintance with the various types of projection equipment, an acquaintance with the various sources of materials, and other important details. For the efficient administration of the local program the following suggestions are offered:

**Local Director of Visual Instruction.** "A practice which has proved successful in a number of our Wisconsin schools is that of



placing some teacher with a reduced teaching load in charge of this work. A good choice for this is a science teacher or some other person with sufficient technical knowledge and administrative ability.

**Ordering Visual Aids and Equipment.** "The local director should acquaint himself with all the various sources of visual aids and should be in a position to inform his teachers as to the availability of the materials which they need. He should keep abreast of the advances made in all phases of visual instruction so that he can recommend the type of equipment to purchase and offer suggestions as to where the latest and best pictures may be secured. He should be so qualified and so prepared that he may at all times act in an advisory capacity in the purchase or rental of materials. His office should serve as the channel through which all materials may be ordered.

**Instructing Local Teachers.** "The local director should acquaint himself with the best visual aids teaching techniques and should strive to improve visual instruction in his classrooms both as regards the pedagogic and the mechanical aspects.

**Making the Best and Widest Possible Use of Available Equipment.** "In one of our leading Wisconsin junior high schools the local director has worked out an ingenious method for making the school's four motion picture projectors available among the fifty or sixty teachers in the building. Each week a chart with spaces for each day and hour of the following week for the four projectors is posted. On this chart each teacher indicates the day or days and the hours during which he wishes to use one of the projectors. Thus the maximum use is gotten from each projector, with the greatest benefit to all concerned. With each projector goes a screen which may be mounted on hooks conveniently placed in the front of each classroom. Similar methods can be worked out for handling other materials also.

**Advantages of Centralized Control and Responsibility.** "Projectors and other materials are in constant need of expert care, and unless some one person is held responsible for their care, they will soon get into such a state of disrepair that they will have little value. It is also essential to centralize the responsibility for the routing of materials and equipment and to see that they are promptly returned.

**The Cost of Visual Instruction.** "When consideration is given to the value received from a well planned and properly executed program of visual instruction, the necessary expenditure will seem but nominal. An average annual per pupil expenditure of from fifty cents to one dollar will probably bring greater returns than any other like expendi-

ture. It is as essential to make provision in the budget for the purchase of projection equipment and for the rental of motion pictures, lantern slides, etc., as it is to make provision for any other equipment or materials. Failure to make such provision denies pupils of the respective educational systems the right to benefit from the latest and most effective aid to learning. While many school administrators and boards of administration have so far hesitated to make the necessary financial provision for its use, the very efficiency of the screen picture as compared with other devices will compel its general adoption for everyday classroom use, just as the textbook is now used.

**Sound and Silent Motion Pictures.** "In the effort to sell sound motion pictures to the educational public, so much emphasis has been placed upon the value of sound motion pictures that school administrators may well have been led to believe that the silent film will become obsolete. The sound motion picture may well supplement the silent picture where sound is an essential element in the learning situation. It is doubtful that the off-stage fixed mechanical lecture of the talkies will ever be generally accepted by educators for use in elementary and secondary schools. It is to be hoped, however, that producers of sound films will produce a wealth of films in such fields as music, language and speech, biography, and other fields in which sound will help to enrich learning.

**The Importance of Photography to the Teacher.** "Photography holds so many possibilities for the teacher that it seems a course in elementary photography ought to be included in every teacher-training program. The photographing of interesting and important events, objects, and places for the production of lantern slides for instructional purposes; the making of photographic records of trips and tours; and the making of photographic records of interesting phases of school life are but a few of the uses to which a camera in the hands of the teacher may be put."

The number and variety of available educational motion pictures is extensive. Schools may secure catalogs of films from the distribution centers listed on page 206. The majority of the state and regional film service bureaus publish lists for general distribution, including films of all types. Some films are furnished without charge, some at nominal fees, and others at rentals which amortize the cost of production. A balanced program of educational films might include some of each, but it is only fair to state that those films which are available upon payment of rental fees are usually worth their cost, as

compared with "free" films. There are many exceptions, of course, such as some films available from Federal Departments and large industries.

The school which uses only rental films or those purchased for permanent use will miss some good educational subjects. On the other hand, those which use only the free films will encounter some sad experiences. A film on television, for example, which tells an interesting story and keeps advertising in the background may be an excellent teaching film. But, if such a film is filled with advertising or other propaganda, it has no place in the classroom.

The cost of good educational films, either for rental or purchase, is a relative matter. There are certain fixed costs, such as cost of production, cost of prints, cost of distribution, etc., which must be paid. The costs of prints and distribution are approximately the same on all films, while the cost of production varies greatly. An educational film of high quality, which costs \$15,000 or more to produce and is offered for sale at \$30 to \$45 for a 16mm. print, may be a much better bargain than a poorly produced film priced at \$20 or less. Furthermore, as the demand for prints increases, it is only logical to suppose that the selling prices and rental fees will be reduced accordingly. More important, a markedly greater use of films currently available will make it possible for the leading producers to provide more and better films. This applies equally to all types of audio-visual aids, and has a very direct bearing upon the equipment necessary for their use in teaching situations.

## VI

# Sources of Information, Materials and Equipment

THE following sources are not complete, as a complete listing of publications alone would require space equivalent to that utilized for the entire HANDBOOK. It is hoped that the sources mentioned here will be of assistance in locating desired information, materials, and equipment. Those who desire to do further reading or secure additional information concerning audio-visual aids and equipment should consult the Readers' Guide, film lists, equipment catalogs, educational bulletins, and the like.

### General References

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### *Radio in Education*

#### **I. Information about Educational Programs:**

1. **Newspaper listings.** These supply most accurate and up-to-date information on station schedules. They should be used as a check against other information obtained in advance. Listings are too brief, however, to give much help in the selection or use of programs.
2. **Radio Guide.** A weekly periodical which gives classified listings of programs a week in advance. A special page called "Listen to Learn" is devoted to educational programs, and another section is devoted to serious music. Some programs are described in detail. On sale at newsstands at 10c per copy. Yearly subscriptions, \$4. Regal Press, Inc., 731 Plymouth Court, Chicago, Ill.
3. **Educational listings.** These are often prepared and distributed by large school systems, WPA educational projects, or state departments of education.

Programs are usually listed by subject-field and grade-level.

4. **Local station advance listings.** Local stations are usually willing to put schools on the mailing list for advance listings of programs and for publicity releases. Material from educational stations is usually particularly helpful.
5. **N.B.C. Presents.** A monthly listing of educational and cultural programs of the N.B.C. Networks. Free, on request to the National Broadcasting Company, RCA Building, Radio City, New York City.
6. **For the Student.** A weekly listing of educational and cultural programs of the C.B.S. Network with considerable advance program details. Free, on request to the Columbia Broadcasting System, 485 Madison Avenue, New York City.
7. **Educational and Cultural Programs from Chicago Stations.** A listing of selected programs available over N.B.C. stations in Chicago. Free, on request to the National Broadcasting Company, Merchandise Mart, Chicago, Ill.

## II. Information about School Broadcasts:

1. **"N.B.C. Music Appreciation Hour."** An *Instructor's Manual*, price 25c, and a *Student's Notebook* for each of series A, B, C, and D, price 10c each, are published annually, and copies may be secured by writing to N.B.C. Music Appreciation Hour, National Broadcasting Company, RCA Building, Radio City, New York City.
2. **"The American School of the Air."** The Columbia Broadcasting System issues a free teacher's manual and classroom guide which may be obtained by writing to the American School of the Air, Columbia Broadcasting System, 485 Madison Avenue, New York City. This year there is a separate guide for each semester.
3. **"The Nation's School of the Air."** This broadcast series over the network of the Mutual Broadcasting System is prepared by Station WLW in Cincinnati. Teachers in Ohio, Indiana, Tennessee, Kentucky, and West Virginia may obtain manuals free. To others the cost is 50c. Address Station WLW, Cincinnati, Ohio.
4. **"Your Health."** This N.B.C. weekly school broadcast is prepared by the American Medical Association. A manual, *Your Health*, may be obtained for 25c from the Johnson Publishing Company, Richmond, Va.
5. **"The Standard School Broadcast."** This is an N.B.C. regional school broadcast of music appreciation heard on the Pacific Coast. It is produced by the Standard Oil Company of California. Free teacher's manual may be obtained by writing the Standard Oil Company, 225 Bush Street, San Francisco, Calif.
6. **Regional school broadcasts.** Some large radio stations support their own series of school broadcasts. Best examples are "School Time," of Station WLS, Chicago, and "Western New York School of the Air," of Station WBEN, Buffalo. Teaching materials are supplied by the stations.
7. **State Schools of the Air.** Best known are the "Ohio School of the Air" and the "Wisconsin School of the Air." Both are conducted by state universities in co-operation with state departments of education and state teachers' associations. Manuals and teaching bulletins are prepared for these programs and can be secured free on request.
8. **City school broadcasts.** Detroit, Cleveland, Rochester, Chicago, New York, Alameda (California), Akron, and a number of other cities produce broadcasts for classroom use. Program announcements and teaching helps can be obtained by schools within the listening area of each city on request.



### III. Books about Education by Radio:

1. Abbot, Waldo. *Handbook of Broadcasting*, McGraw-Hill Book Company, Inc., New York, 1937. \$3.00
2. Harrison, Margaret. *Radio in the Classroom*, Prentice-Hall, Inc., New York, 1937. \$2.50
3. Darrow, Ben H. *Radio, the Assistant Teacher*, R. G. Adams and Company, Columbus, Ohio, 1932. \$1.90
4. Hill, Frank. *Listen and Learn*, American Association for Adult Education, New York, 1937. \$1.25
5. MacLatchy, J., editor. *Education on the Air, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938*, Yearbooks of the Institute for Education by Radio, Ohio State University Press, Columbus, Ohio. \$3.00 per volume.
6. Marsh, C. S., editor. *Educational Broadcasting, 1936, 1937*, Proceedings of the First and Second National Conferences on Educational Broadcasting, University of Chicago Press, Chicago, Ill. \$3.00
7. Department of Research and Education of the Federal Council of the Churches of Christ in America. *Broadcasting and the Public*, Abingdon Press, New York, 1938. \$1.50
8. Eisenberg, Azriel L. *Children and Radio Programs*, Columbia University Press, New York, 1936. \$3.00
9. Koon, Cline M. "How to Use Radio in School," University of Wyoming, Laramie, Wyo., 1937. \$1.00 (Mimeographed)
10. Stewart, Irvin. *Local Broadcasts to Schools*, University of Chicago Press, Chicago, Ill., 1939. \$2.00

### IV. Pamphlets and Bulletins:

1. "Journal of the AER." A bulletin published monthly (except June, July, and August) by the Association for Education by Radio, 228 N. LaSalle Street, Chicago, Ill. Membership dues including the "Journal," \$2.00 a year.
2. "The News Letter." A monthly bulletin bringing information to teachers about radio, motion pictures, and the press. Sent free, on request to the editors, Bureau of Educational Research, Ohio State University, Columbus, Ohio.
3. Bartlett, Kenneth. "How to Use the Radio," National Association of Broadcasters, Washington, D. C., 1937. Distributed free upon application to your local radio station. Deals with planning and broadcasting, but not reception.
4. Koon, Cline M. "The Art of Teaching by Radio," Government Printing Office, Washington, D. C., 1933. 10 cents. May be obtained from the Superintendent of Documents, Washington, D. C. Deals chiefly with the preparation and broadcasting of educational programs.
5. "Radio Manual," "Glossary of Radio Terms," "Handbook of Sound Effects," and "Catalog of Educational Radio Script Exchange," United States Department of the Interior, Office of Education, Radio Project, Washington, D. C. These helps to amateur producers are available on request.
6. Page, Meredith. "Sound Effects for the Amateur," Bureau of Educational Research, Ohio State University, Columbus, Ohio, 1937. 25c. (Radio Bulletin No. 14.)
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8. Hogan, John V.L. and Wilmotte, R.M. "Auditory Aids in the Classroom," Committee on Scientific Aids to Learning, New York, 1938. Free.
9. Co-operating Teachers and Staff of Evaluation of School Broadcasts Project. "How to Use the Radio in the Classroom," National Association of Broadcasters, Washington, D. C., 1939. Free through local radio stations.

10. Tyler, I. Keith, editor. "Radio in Education," Department of Supervisors and Directors of Instruction of the National Education Association of the United States, Washington, D. C., 1939. 25c. This bulletin is directed to the classroom teacher with practical suggestions for activities which he may pursue in making use of the radio.
11. "The Radio in Education." *The Phi Delta Kappan*, XXI (March, 1939). Ovid Bell Press, 1201 Bluff Street, Fulton, Mo., 35c. An excellent over-view of the whole field of educational broadcasting.

## V. Organizations from Whom Information May Be Obtained:

1. Association for Education by Radio, 228 N. LaSalle Street, Chicago, Ill.
2. Federal Radio Education Committee, U.S. Office of Education, Federal Security Agency, Washington, D.C.
3. National Advisory Council on Radio in Education. This organization is no longer active, but some pamphlet material is still available. Address: 60 East 42nd Street, New York City.
4. Institute for Education by Radio, Ohio State University, Columbus, Ohio.
5. Radio Division, Bureau of Educational Research, Ohio State University, Columbus, Ohio.
6. Committee on Scientific Aids to Learning, 41 East 42nd Street, New York City.
7. Audio-Visual Education, Teachers College, Columbia University, New York City.
8. Women's National Radio Committee, 113 West 57th Street, New York City.
9. National Association of Broadcasters, 1626 K Street, N. W., Washington, D. C.

## STATE AND REGIONAL DISTRIBUTION CENTERS

THE following are distributing centers for audio-visual aids of all types. Some offer films, film slides, glass slides, etc., to schools and other nontheatrical organizations only in a limited area. Others will provide service to anyone within reasonable distance. Those who are using or planning to use such materials should secure the service list of nearest distributing center.

Alabama, University—James F. Caldwell, Superintendent of Visual Aids, University of Alabama.

Arizona, Tucson—Max P. Vosskuhler, Director of Extension, University of Arizona.  
California, Berkeley—Boyd B. Rakestraw, Extension Division, University of California.

" Los Angeles—E. E. Swingle, Extension Division, University of California.

" Los Angeles—Russell E. Berkley, Visual Aids Supervisor, Department of Education.

" Stockton—George Eby, Director of Visual Education, Stockton Junior College.

" Ukiah—L. A. Lawson, Visual Education Department, Medocino County Schools.

Colorado, Boulder—Miss Lelia Trolinger, Bureau of Visual Instruction, University of Colorado.

" Greeley—Dr. James D. Finn, Colorado State College of Education.

Connecticut, New Haven—Donald A. Eldridge, Connecticut Educational Film Library, New Haven High School Building.

Florida, Gainesville—Miss Bernice Ashburn, Department of Audio-Visual Instruction, University of Florida.

Georgia, Atlanta—Dr. J. C. Wardlaw, General Extension Service, University System of Georgia.

Hawaii, Honolulu—Mrs. Etta R. Washburn, University Extension Division, University of Hawaii.

Idaho, Pocatello—Ivan Rowland, Film Service Division, University of Idaho.

Illinois, Champaign—Lewis V. Peterson, Supervisor of Visual Aids, University of Illinois.

Indiana, Bloomington—Mrs. Pauline J. Ellis, Bureau of Visual Instruction, Indiana University.

Iowa, Ames—H. L. Kooser, Visual Instruction Service, Iowa State College.

" Iowa City—L. W. Cochran, Department of Visual Instruction, University of Iowa.

Kansas, Lawrence—Fred S. Montgomery, Bureau of Visual Instruction, Extension Division, University of Kansas.

Kentucky, Lexington—W. Gayle Starnes, Audio-Visual Aids Department, University of Kentucky.

Louisiana, Baton Rouge—Miss Mary Clint Irion, Department of Visual Instruction, State Department of Education.

" University—P. H. Griffith, General Extension Service, Louisiana State University.

Maine, Orono—O. S. Lutes, Dean, School of Education, University of Maine.

Maryland, Baltimore—J. Wallace Page Jr., Maryland Academy of Sciences.

Massachusetts, Boston—Helen B. Garrity, Director of Visual Instruction, State Department of Education.

" Boston—Abraham Krasker, Director, Division of Teaching Aids, Boston University.

" Cambridge—James R. Brewster, Director, Harvard Film Service, Harvard University.

Michigan, Ann Arbor—F. L. Lemler, Director, Visual Education, University of Michigan.

- Michigan, Mt. Pleasant—Frederick Brail, Central State Teachers College.
- Minnesota, Minneapolis—H. B. Gislason, Bureau of Visual Instruction, University of Minnesota.
- Missouri, Columbia—Mrs. Margaret R. Kimes, In Charge of Visual Education Service, University of Missouri.
- Montana, Helena—Harry A. Norton, Supervisor, Visual Aids in Education, Department of Public Instruction.
- Nebraska, Lincoln—A. A. Reed, Director, University Extension Division, University of Nebraska.
- New Hampshire, Durham—Donald W. Smith, Extension Specialist in Visual Aids, University of New Hampshire.
- " " Hanover—R. Haven Falconer, Director, Dartmouth College Films.
- New Jersey, Trenton—Miss Katherine Greywacz, New Jersey State Museum.
- New York, Buffalo—Buffalo Society of Natural Science.
- " " Cortland—Dr. H. Dew. de Groat, Principal, State Normal and Training School.
- " " New York City—New York University Film Library, Washington Square.
- " " New York City—American Museum of Natural History, Motion Picture Division, Central Park West at 79th.
- " " Syracuse—Dr. Russell T. Gregg, School of Education, Syracuse University.
- North Carolina, Chapel Hill—Charles F. Milner, In Charge of Visual Instruction, University Extension Division, University of North Carolina.
- North Dakota, Fargo—W. C. Palmer, Director of Visual Education, North Dakota State College.
- " " Grand Forks—J. A. McCrae, University Extension Division, University Station.
- Ohio, Columbus—B. A. Aughinbaugh, Director of Visual Instruction, State Department of Education.
- Oklahoma, Norman—R. Boyd Gunning, Extension Division, University of Oklahoma.
- Oregon, Corvallis—U. S. Burt, Visual Instruction Department, Oregon State College.
- Pennsylvania, Lewisburg—H. W. Holter, Registrar, Classroom Film Library, Bucknell University.
- " Millersville—Milton H. Steinhauer, Sensory Aids Director, State Teachers College.
- " Philadelphia—Commercial Museum.
- " Pittsburgh—James S. Kinder, Director, P.C.W. Film Service, Pennsylvania College for Women.
- Puerto Rico, San Juan—H. A. Martin, Department of Education.
- South Carolina, Columbia—Charles S. James, Audio-Visual Aids Bureau, University of South Carolina.
- South Dakota, Vermillion—A. E. Mead, Director, Department of Visual Education, University of South Dakota.
- Tennessee, Nashville—Mrs. A. F. Kuhlman, Director, Joint University Libraries, Vanderbilt University.
- " Knoxville—Oscar E. Sams, Jr., Division General Extension, University Station.
- Texas, Austin—Mrs. Charles Joe Moore, Director, Visual Instruction Bureau, Division of Extension, University of Texas.
- " Canyon—Mrs. T. V. Reeves, Director, Film Division, Bureau of Public Service, West Texas State Teachers College.
- " Huntsville—W. E. Lowry, Department of Public Service, Sam Houston State Teachers College.
- " Kilgore—W. F. Archibald, Director, East Texas Bureau of Visual Education, Kilgore Junior College.



- " Lubbock—J. F. McDonald, Director, Division of Extension, Texas Technological College.
- " Nacogdoches—A. L. Long, Department of Education, S. A. Austin State Teachers College.
- Utah, Provo—Thomas Peterson, Secretary, Bureau of Visual Instruction, Brigham Young University.
- Vermont, Burlington—Mrs. Virginia Whipple, Robert Hull Fleming Museum, Classroom Film Library, University of Vermont.
- Virginia, Richmond—James W. Brown, Supervisor, Audio-Visual Education, State Board of Education.
- Washington, Ellensburg—Ernest L. Muzzall, Director of Public Service, Central Washington College of Education.
- " Pullman—W. G. Gnaedinger, Head, Bureau of Visual Instruction, State College of Washington.
- West Virginia, Morgantown—H. B. Allen, College of Education, West Virginia University.
- Wisconsin, Madison—J. E. Hansen, Bureau of Visual Instruction, University of Wisconsin.

## SOURCE LISTS OF EXHIBITS, PAMPHLETS, CHARTS, SLIDES, AND MOTION PICTURES

THE Library Visual Aids Service, New Jersey State Teachers College, Upper Montclair, N. J., has published several source lists which were edited by Dr. Lili Heimers, Director of Visual Aids. The lists now available include the following:

**VISUAL AIDS.** Exhibits, charts, maps, graphs, and pictures available from various agencies and useful in high school and college teaching. \$1.

**VISUAL AIDS IN THE REALM OF GEOGRAPHY.** Source list for elementary, intermediate, and high schools and colleges. 50c.

**VISUAL AIDS IN THE REALM OF CHEMISTRY.** Charts, exhibits, films, pictures, slides, and publications, for use in junior and senior high schools and colleges. 25c.

**PAN-AMERICAN.** Visual and teaching aids on Latin America, including individual countries, Spain, and Spain in the United States. 50c.

**VISUAL AIDS IN THE REALM OF BIOLOGY.** Sources of useful materials to aid in teaching general science and high school and college biology. 50c.

Other source lists are being prepared by the College Library Visual Aids Service for release from time to time. A request by letter or postal card will secure a complete list of available publications.

### *Materials Available from Industries*

The list which follows is decidedly incomplete and is included merely to indicate the types of instructional materials which may be obtained at little or no cost. There are literally hundreds of such sources, including almost all large industrial organizations and the majority of the Federal bureaus and departments.

### *Animal Products*

Armour & Co., Chicago, Ill.

Motion picture, "The Romance of Food," available through National Council Y.M.C.A., 347 Madison Avenue, New York City, Attn.; Mr. A. L. Frederick, Associate Director.

Kraft-Phoenix Cheese Corp., 400 Rush Street, Chicago, Ill.

Recipe folders and booklet of "Favorite Recipes." Educational booklet, "The Romance of Cheese." 16 mm. motion picture "Triumph of the Century." Free to teachers.

### *Cereals*

American Institute of Baking, Department of Nutrition, 9 Rockefeller Plaza, New York City. Interesting pamphlets, "The Physician and Our Daily Bread," "The Right Way to Right Weight," and "The Wheel of Good Health" poster regarding varied and balanced diet, free to teachers.

Kellogg Company, Home Economics Department, Battle Creek, Mich.

Folders, "Food for Growing Boys and Girls," "Facts about Kellogg's," and Health Score Charts, free to teachers.

Pan-American Union, Washington, D.C.

Interesting booklets on countries, cities, commodities, etc., of the Pan-American Republic, 5c each.

Pillsbury Flour Mills Company, Minneapolis, Minn.

Educational exhibit 38 x 50 wall chart on wheat and flour production, 50c. Booklet, "The Story of Flour," free—one to a person.

### ***Forest Products***

Armstrong Cork Company, Lancaster, Pa.

Linoleum educational exhibit \$1, and cord educational exhibit, \$2.

Chicago Cork Works Co., 2600 North Crawford Avenue, Chicago, Ill.

Very complete exhibits of cork material, showing manufacture and finished products, \$1 each.

Strathmore Paper Company, West Springfield, Mass.

Booklets, "Making Expressive Strathmore Papers," and "Psychology of Paper in Advertising and Correspondence," free. Bottle exhibit of paper in various stages of manufacture, \$1.

### ***Fruits***

California Fruit Growers Exchange, Educational Division, Los Angeles, Calif.

Pamphlet for primary grades with illustrations to be colored. An illustrated map folder for intermediate grades. Also booklets on lemons and oranges, recipes, and health information available in limited quantities. Free for classwork.

### ***Geography Materials***

Alaska Steamship Company, Seattle, Wash.

"Good Natured" map of Alaska, free to teachers. Booklets, "Alaska Ahead" and "Scenery Ahead in Alaska," free.

### ***Mineral Products***

Barber Asphalt Company, Barber, N. J.

Booklet, "The Wonderland of Trinidad." (Free). Pictorial map of the island of Trinidad, 10c.

The Cambridge Glass Company, Cambridge, Ohio

Interesting booklet, "The Art of Making Fine Glassware," and many other pamphlets, free.

The Georgia Marble Company, Tate, Ga.

Booklet, "The Story of Georgia Marble."

### ***Textiles***

American Thread Company, Inc., New York City.

Booklet, "The Story of Cotton Thread," free.

Botany Worsted Mills, Passaic, N. J.

Booklet, fabric and yarn primers, free. Exhibit showing the processing of raw wool into the finished product, \$1.

Celanese Corporation of America, 180 Madison Avenue, New York City.

Samples of rayon fabrics and booklets with information regarding their care. Free to teachers.

L. C. Chase and Co., Advertising Dept., 295 Fifth Ave., New York City.

Booklet, containing cleaning suggestions, "On the Spot." Free to teachers.

Real Silk Hosiery Mills, Inc., Indianapolis, Ind.

Booklet, "The Legend of Silk," a cocoon, and miniature skein of raw silk, for distribution to teachers and students.

Singer Sewing Machine Company, Educational Dept., Singer Building, New York City. Educational publications for teachers and students.

William Skinner and Sons, 222 West Adams St., Chicago, Ill.

Illustrated booklets, "The Story of Silk," and "The Romantic Story of Silk."

*Miscellaneous*

- The American Sugar Refining Company, 120 Wall Street, New York City.  
Text, "The Story of Sugar," and Domino sugar educational exhibit. Limited one to a school and to urban communities (east of the Mississippi River) where there is representative distribution for Domino sugars.
- Clay-Adams Company, Inc., 44 East 23rd Street, New York City.  
Very complete assortment of biological and other scientific specimens, models, charts, etc. Write for catalog.
- Denoyer-Geppert Company, 5235 Ravenswood Avenue, Chicago, Ill.  
Booklets, "Aquariums and Terrariums in Your Classroom," "B3 Fundamental Maps," "B13 Vitalized Latin," free to teachers.
- General Biological Supply House, 761 East 69th Place, Chicago, Ill.  
Biological and other scientific materials for school use. Write for literature.
- Hershey Chocolate Corp., Hershey, Pa.  
Educational wall chart and supplementary booklet, "The Story of Chocolate and Cocoa." Recipe books for home-economics classes. Available to teachers only.
- Hills Bros. Coffee, Inc., 2 Harrison Street, San Francisco, Calif.  
Booklet, "Coffee—How It's Grown and How to Make It," free.
- Libby, McNeill & Libby, Sales Promotion Dept., Chicago, Ill.  
Filmslides in sound, "The People's Choice," "Let's Go in the Movies," and "Doubled and Redoubled," available free for classes in advertising, merchandising, and retail salesmanship in high schools and colleges.
- New York Zoological Park, New York City.  
130 animal art stamps—photographs taken of animals in the New York Zoological Park. Contains carefully written captions giving authentic information of real educational value. Album with 10 stamps to start your collection, 25c; postage 3c. Remaining 120 subjects sold in sets of 20 stamps each, 10c per set.
- Spencerian Pen Company, 434 Broadway, New York City.  
Chart, "The Development of the Art of Writing," and booklets, "Little Lessons in Pen Drawing," "Spencerian Broad-Edge Bulletin," free. Complete set of twenty-six famous American documents and letters with textbook, \$1.

*Sources of 16 mm. and 35 mm. Motion Pictures*

- Academic Film Co., Inc., RKO Bldg., Radio City, New York City  
Produce-distribute history films—16 mm. or 35 mm.—sound—rent or sell.
- Allis-Chalmers Mfg. Co., Advertising Department, Milwaukee, Wis.  
Agricultural subjects—16 mm. sound mostly—free.
- American Can Company, Home Economics Dept., 230 Park Ave., New York City  
1 sound, 1 silent—16 mm.—free.
- American Dental Association, Bureau of Public Relations, 212 E. Superior St., Chicago, Ill. 16 mm.—silent and sound—rent.
- American Institute of Steel Construction, Inc., 101 Park Ave., New York City  
16 mm. and 35 mm.—sound and silent—free.
- American League of Professional Baseball Clubs, 310 S. Michigan Ave., Chicago, Ill. 2 films—16 mm. or 35 mm. sound—free.
- American Museum of Natural History, 79th & Central Park W., New York City  
16 mm. sound and silent—rent.
- American Nature Association, 1214 16th St., N.W., Washington, D. C.  
16 mm. silent films on wild life and outdoors—rent or sell.
- American Social Hygiene Association, 50 W. 50th St., New York City  
16 mm. and 35 mm. sound and silent—rent or sell.



- Andlauer Film Company, Ozark Bldg., Kansas City, Mo.  
Produce-distribute industrial films—16 mm. and 35 mm. sound and silent—free—serve Missouri Valley.
- Annis, R. B., Company, 1101 N. Delaware St., Indianapolis, Ind.  
16 mm. sound and silent—rent—serve Midwest.
- Association of School Film Libraries, 9 Rockefeller Plaza, New York City  
Sell Denver school-produced films—16 mm. sound.
- Baptista, C. O., 325 W. Huron St., Chicago, Ill.  
Produce-distribute religious and Spanish films—mostly 16 mm. sound—rent or sell.
- Bausch & Lomb Optical Company, 635 St. Paul St., Rochester, N. Y.  
2 industrial films—16 mm. or 35 mm. silent—free or will sell.
- Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.  
(Branches: 30 Rockefeller Plaza, New York City; 716 N. LaBrea Ave., Hollywood). Large library—16 mm. sound and silent—rent and sell.
- Boy Scouts of America, Public Relations Service, 2 Park Ave., New York City  
16 mm. sound and silent scout films, some 35 mm.—rent or sell.
- Bray Pictures Corp., Educational Dept., 729 Seventh Ave., New York City  
Produce-distribute—16 mm. and 35 mm. sound and silent—rent or sell.
- British Library of Information, 45 Rockefeller Plaza, New York City  
Films on wartime Britain—mostly 16 mm. sound and 35 mm. sound—sell.
- Burton Holmes Films, Inc., 7510 N. Ashland Ave., Chicago, Ill.  
Produce-distribute travel films mainly—16 mm. silent, some sound—rent, sell, 6 free.
- Canadian Government Motion Picture Bureau, Dept. of Trade and Commerce, Ottawa, Canada. Produce-distribute 16 mm. sound and silent films—rent, sell, some free.
- Canadian National Railways, Motion Picture Library, Montreal, Canada  
Travel films—16 mm. silent—free—distribute through Passenger Representatives.
- Castle Films, RCA Bldg., New York City (offices also in Chicago and San Francisco). Produce-distribute 16 mm. sound and silent—sell—some free industrials.
- Chicago Film Laboratory, Inc., 18 W. Walton Pl., Chicago, Ill.  
Produce-distribute industrials—16 mm. and 35 mm. sound and silent—free.
- Church, Frank, Films, 6117 Grove St., Oakland, Calif.  
Producer-distributor—16 mm. and 35 mm. sound and silent—rent, sell, some free.
- College Film Center, 59 E. Van Buren St., Chicago, Ill.  
Many films—16 mm. sound and silent—few 35 mm. sound—rent and sell.
- Columbia Pictures Corp., 729 Seventh Ave., New York City  
Features and short subjects—35 mm. sound—rent through Exchanges (write for nearest Exchange.)
- Coronet Productions, Glenview, Ill.  
Produce-distribute teaching films—16 mm. sound—sell.
- DeVry Corporation, 1111 Armitage Ave., Chicago, Ill.  
Mostly 16 mm. sound, a few 16 mm. and 35 mm. silent—rent or sell.
- Distributor's Group, 119 Luckie St., N.W., Atlanta, Ga.  
Large library—Gutlohn, Harmon, Castle subjects—mostly 16 mm. sound, some silent—rent and sell—serve South and Southwest.
- Eastin 16 mm. Pictures Company, 707 Putnam Bldg., Davenport, Iowa (Burns Bldg., Colorado Springs, Colo.) Many 16 mm. sound, some 16 mm. silent—rent.
- Eastman Kodak Co., Teaching Films Division, 343 State St., Rochester, N. Y.  
Produce-distribute classroom and medical films—all 16 mm. silent except 2 in sound—sell (also rent medical films).

- Eastman Kodak Stores, Kodascope Libraries Division, 356 Madison Ave., New York City. Many 16 mm. sound and silent—rent and sell.
- Edited Pictures System, Inc., 330 West 42nd St., New York City  
Produce-distribute 16 mm. sound and silent—rent or sell.
- E. I. DuPont de Nemours Co., Advertising Dept., Wilmington, Del.  
Films on chemistry—16 mm. or 35 mm. sound—free.
- Emerson Yorke Studio, 130 W. 46th St., New York City  
Produce-distribute 16 mm. and 35 mm. sound—rent or sell, some free.
- Erpi Classroom Films, Inc., 35-11 35th Ave., Long Island City, N. Y.  
Produce-distribute classroom films—16 mm. and 35 mm. sound—sell (also rent teacher training, child psychology films).
- Federal Housing Administration, Motion Picture Section, 90 Church St., New York City. Films on housing—all in 16 mm. sound, 1 silent.
- Films, Incorporated, 330 W. 42nd St., New York City (Branch Offices in Chicago, Portland, Oregon, Los Angeles, Austin, Atlanta). Large library of major features and educational films—mostly 16 mm. sound, some silent—rent (also sell short subjects).
- Films of Commerce Co., Inc., 21 W. 46th St., New York City  
Produce-distribute 16 mm. and 35 mm. silent mostly, some sound—sell from headquarters—rent through exchanges, some free.
- Ford Motor Company, Dept. of Photography, Dearborn, Mich.  
Produce-distribute travel and industrial films—16 mm. and 35 mm. sound—free through Ford dealers.
- Ganz, William J. Co., 19 East 47th St., New York City  
Producer-distributor 16 mm. sound and silent—free.
- Garrison Film Distributors, Inc., 1600 Broadway, New York City  
Large library—16 mm. sound and silent, some 35 mm.—rent and sell.
- General Electric Co., Visual Instruction Section, Schenectady, N. Y.  
Produce-distribute films on electricity—16 mm. and 35 mm. sound and silent—free.
- General Motors Corporation, Dept. of Public Relations, 1775 Broadway, New York City. Industrial, travel, safety films—16 mm. and 35 mm. sound—free.
- Goodyear Tire and Rubber Co., Motion Picture Dept., Akron, Ohio  
16 mm. and 35 mm. silent industrial films—free (pays transportation one way).
- Grace Line, Publicity Dept., 247 Park Ave., New York City  
Travel Films—mostly 16 mm. silent or 35 mm. sound—free.
- Gutlohn, Walter O., Inc., 35 W. 45th St., New York City  
Extensive library of features and educational films—mostly 16 mm. sound—some silent—rent or sell.
- Handy, Jam, Organization, The, 2821 E. Grand Blvd., Detroit, Mich.  
Produce-distribute vocational education films—16 mm. or 35 mm. sound—rent and sell.
- Harmon Foundation, 140 Nassau Street, New York City—Religious and educational films—16 mm.—rent.
- Harvard Film Service, Biological Laboratories, Cambridge, Mass.  
Produce-distribute 16 mm. sound and silent—some 35 mm.—rent and sell.
- Ideal Pictures Corporation, 28 E. 8th St., Chicago, Ill.—2402 W. 7th St., Los Angeles, Calif.—Bertram Willoughby Pictures, Inc., 1600 Broadway, New York City. Vast library—16 mm. sound and silent—rent, sell—a few free.
- International Dental Health Foundation for Children, Inc., 130 East End Ave., New York City. Dental Health—16 mm. or 35 mm. silent—rent or sell.
- International Harvester Co., Inc., 180 N. Michigan Ave., Chicago, Ill.  
Industrial and agricultural films—16 mm. and 35 mm. sound—free.
- Lewis Film Service, 216 E. First St., Wichita, Kan.  
Many 16 mm. sound and silent—rent or sell.

- Metropolitan Life Insurance Company, 1 Madison Ave., New York City  
Health and safety films—16 mm. and 35 mm. sound—1 silent—free.
- Metropolitan Motion Picture Co., 50 Branford Place, Newark, N. J.  
16 mm. and 35 mm. sound and silent—rent or sell.
- Metropolitan Museum of Art, 5th Ave. at 82nd St., New York City  
Mostly art films—16 mm. or 35 mm. silent—rent or sell.
- Modern Talking Picture Service, 9 Rockefeller Plaza, New York City  
Industrial films—16 mm. and 35 mm. sound—free (rent sales training films).  
(Write for address of nearest exchange.)
- Mogull's Inc., 61 West 48th St., New York City  
Large library—16 mm. sound and silent—rent and sell.
- Museum of Modern Art Film Library, 11 W. 53rd St., New York City  
9 series of programs of outstanding films from 1895 to present—16 mm. and 35 mm. sound and silent—rent (sell "The City").
- National Association of Manufacturers, 14 W. 49th St., New York City  
Films on American Economics—16 mm. and 35 mm. sound—2 silent—free.
- National Dairy Council, 111 N. Canal St., Chicago, Ill.  
2 on milk—16 mm. sound—free from locals, sold by National Council.
- National Motion Picture Company, Mooresville, Ind.  
Producer-distributor of health films—16 mm. and 35 mm. sound and silent—rent or sell.
- National Safety Council, Inc., 20 N. Wacker Dr., Chicago, Ill.  
Safety films—16 mm. sound and silent—1 in 35 mm.—rent.
- National Society for the Prevention of Blindness, 1790 Broadway, New York City  
1 on eye care—16 mm. and 35 mm. silent—free or will sell.
- National Tuberculosis Association, 1790 Broadway, New York City  
Health Films—mostly 16 mm. and 35 mm. sound—sells but locals rent.
- National Youth Administration, 2145 C St., N. W., Washington, D. C.  
Films on youth work programs—16 mm. sound and silent—free. (Write State Administrators).
- New York University Film Library, Washington Square, New York City  
4 NYU Educational Film Institute productions—16 mm. sound—rent.
- Northern Baptist Convention, 152 Madison Ave., New York City  
Films on missions—16 mm. silent—rent.
- Ohio Department of Education, Visual Instruction Exchange, Columbus, Ohio  
Producer-distributor of 23 Ohio travelogs—16 mm. or 35 mm. sound—free or will sell.
- Ohio State University, Bureau of Educational Research, Columbus, Ohio  
Series of school-made traffic safety films—16 mm. silent—sell.
- Pan American Union, Section of Motion Pictures, Washington, D. C.  
Films on Latin America—mostly 16 mm. and 35 mm. sound—free or will sell.
- Presbyterian Church, Board of Foreign Missions, 156 Fifth Ave., New York City  
(Offices also in Chicago and San Francisco). Films on missionary work—mostly 16 mm. silent—rent or sell.
- Presbyterian Church, Board of National Missions, 156 Fifth Ave., New York City  
(Offices also in Chicago and San Francisco)  
Films on missions—16 mm. silent—rent.
- Progressive Education Association, the Commission on Human Relations, 71 Washington Square, New York City. 57 short subjects in Human Relations Series, excerpted from theatrical photoplays—16 mm. sound—rent.
- Psychological Laboratories (C. J. Warden & G. M. Gilbert), Columbia University, New York City. Produce-distribute psychology films—16 mm. silent—sell.
- Quaker Oats Company, Advertising Department, 141 Jackson Blvd., Chicago, Ill.  
2 industrial films—16 mm. or 35 mm. silent—free.

- RCA Manufacturing Company, Inc., Educational Department, Camden, N. J.  
Films on radio, television, electronics, and recording—16 mm. and 35 mm. sound—free.
- Ray-Bell Films, Inc., 2269 Ford Parkway, St. Paul, Minn.  
Produce-distribute industrial films—mostly 16 mm. and 35 mm. sound—free.
- Rothacker, Douglas, D., 729 Seventh Ave., New York City  
Producer-distributor of industrial films—16 mm. and 35 mm. sound—free.
- Rowland Rogers Productions, 165 W. 46th St., New York City  
One 16 mm. silent—free.
- Scandia Films, Inc., 220 W. 42nd St., New York City  
Films on Sweden—16 mm. and 35 mm. sound—rent or sell.
- Scholastic Coach Magazine, 220 East 42nd St., New York City  
Film on volleyball—16 mm. silent—rent.
- Social Security Board, Federal Security Agency, Washington, D. C.  
Films on Security Program—16 mm. sound—free from local Regional Offices.
- Southern Pacific Lines, Passenger Traffic Department, Straus Bldg., Chicago, Ill.  
Travel films—16 mm. silent, 1 sound—free.
- Southern Visual Equipment Co., 492 S. Second St., Memphis, Tenn.  
Many 16 mm. sound films—rent and sell—serve southern states.
- Stark Films, Howard and Centre Sts., Baltimore, Md.  
Produce-distribute 16 mm. and 35 mm. sound and silent—rent, sell, some free.
- Swedish Travel Information Bureau, 630 Fifth Ave., New York City  
Films on Sweden—16 mm. sound and silent—rent or sell.
- Teaching Film Custodians, Inc., 25 W. 43rd St., New York City  
Short subjects, selected from products of major theatrical companies—mostly 16 mm. sound—lease.
- Tennessee Valley Authority, Film Circulation Unit, Knoxville, Tenn.  
Films on TVA—16 mm. and 35 mm. silent mostly—2 in sound—free.
- Texas Visual Education Co., 305 West Tenth St., Austin, Tex.  
Branches: Oklahoma Visual Education Co., 212 N. W. 23rd St., Oklahoma City, Okla.; Reagan Visual Education Co., Rhodes Bldg., Atlanta, Ga.
- Erpi, Bell & Howell films, and major features—16 mm. sound—rent, sell, some free. Serve Southwest.
- Theodore Roosevelt Memorial Association Film Library, 29 E. 20th St., New York City. Biographical films—16 mm. and 35 mm. silent—free to schools and will sell.
- United Fruit Company, Educational Dept., Pier 3, North River, New York City  
Films on banana industry—16 mm. sound and silent—free.
- United Projector and Film Corporation, 228 Franklin St., Buffalo, N. Y.  
Mostly 16 mm. silent—some 16 mm. sound—rent, sell—few free—serve east of Mississippi.
- U. S. Department of Agriculture, Motion Pictures, Extension Service, Washington, D. C. Films on Agriculture—16 mm. and 35 mm. sound and silent—free. Prints may be obtained from any extension divisions of state institutions for small service charge. (Write for nearest extension divisions).
- U. S. Department of Education, 16 mm. silent—defense training films.
- U. S. Department of the Interior, Bureau of Mines, Pittsburgh, Pa.  
Films on mining and manufacturing processes—16 mm. and 35 mm. silent mostly—some sound—free. Prints available also through many university and state institutions, extension divisions and stations in Bartlesville, Birmingham, Salt Lake City, and Seattle.
- U. S. Department of the Interior, Division of Information, Washington, D. C.  
Films on Department activities—16 mm. and 35 mm. sound and silent—free.
- U. S. Department of Labor, Children's Bureau, Washington, D. C.  
Films on child health—mostly 16 mm. silent—2 sound—free.



- U. S. Department of Labor, Division of Labor Standards, Washington, D. C.  
One on industrial health—16 mm. or 35 mm. sound—free.
- U. S. Department of Labor, Women's Bureau, Washington, D. C.  
Problems and standards of working women—16 mm. and 35 mm. silent—1 sound—free.
- U. S. Housing Authority, Federal Works Agency, Washington, D. C.  
One on housing—16 mm. or 35 mm. sound—free.
- U. S. Marine Corps, Marine Corps Photographic Section, Marine Corps Schools, Quantico, Va. One on Corps activities—16 mm. or 35 mm. sound—free.
- U. S. Maritime Commission, Washington, D. C.  
One on Commission training program—16 mm. or 35 mm. sound—free—lease.
- U. S. Navy Recruiting Service, 641 Washington St., New York City  
Travel and navy films—16 mm. sound and silent—35 mm. sound—free. Apply to officer-in-charge, nearest recruiting station.
- U. S. Steel Corporation, Advertising Department, 436 Seventh Ave., Pittsburgh, Pa. (Offices in Chicago, New York, Birmingham, Cleveland, San Francisco)  
Industrial films—16 mm. and 35 mm. sound mostly—free.
- Universal Pictures Company, Inc., Rockefeller Center, New York City  
Features and short subjects—35 mm. sound—rent through Exchanges (Write for nearest Exchange).
- University of Oklahoma Press, Norman, Okla.  
Two on American Indians—16 mm. silent—rent or sell.
- Venard, C. L., 702 S. Adams St., Peoria, Ill.  
Producer-distributor of agricultural films—16 mm. and 35 mm. silent, some sound—rent, some free.
- Virginia Conservation Commission, Division of Publicity, Richmond, Va.  
Travel and industrial films—16 mm. and 35 mm.—sound and silent—free.
- Visual Art Films, 1303 Porterfield St., Pittsburgh, Pa.  
16 mm. sound films—rent or sell.
- Visual Education Service, 131 Clarendon St., Boston, Mass.  
Many 16 mm. sound and silent films—rent—sell—some free—serve East of Mississippi.
- Vocational Guidance Films, Inc., Old Colony Bldg., Des Moines, Iowa  
Produce vocational guidance films—16 mm. or 35 mm. sound—sell.
- Western Electric Company, 195 Broadway, New York City  
Industrial films—16 mm. or 35 mm. sound—free—will sell.
- Western Pine Association, Yeon Bldg., Portland, Ore.  
Industrial films—16 mm. and 35 mm. sound—free.
- Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.  
Industrial films—16 mm. and 35 mm. sound—35 mm. silent—free from headquarters and district offices.
- Wholesome Films Service, Inc., 48 Melrose St., Boston, Mass.  
Large library—16 mm. and 35 mm. sound and silent—rent—sell—few free.
- Wild Flower Preservation Society, 3470 Oliver St., Washington, D. C.  
Films on wild flowers—16 mm. silent; 1 in 35 mm.—rent or sell.
- Wilding Picture Productions, Inc., 7635 Grand River, Detroit, Mich.  
Produce-distribute 16 mm. and 35 mm. sound—free.
- Work Projects Administration, Division of Information, 1734 New York Ave., N.W., Washington, D. C. Films on Government activities—16 mm. sound (available only through film libraries).
- Yale University Press Film Service, 386 Fourth Ave., New York City  
Historical films—16 mm. and 35 mm. silent—rent or lease.
- Y.M.C.A. Motion Picture Bureau, 347 Madison Ave., New York City; 19 S. La-Salle St., Chicago; 351 Turk St., San Francisco; 1700 Patterson Ave., Dallas.  
Large library—16 mm. sound and silent—rent and many free.

## VISUAL MATERIALS AND EQUIPMENT

### *Maps, Charts, and Globes*

Denoyer-Geppert Company, 5235 Ravenswood Ave., Chicago, Ill.  
 National Geographic Society, Sixteenth and M Sts., Washington, D. C.  
 A. J. Nystrom & Co., 3333 Elston Ave., Chicago, Ill.  
 Weber Costello Company, Chicago Heights, Ill.

### *Photographs and Prints*

Art Extension Press, Inc., Westport, Conn.  
 Colonial Art Company, Oklahoma City, Okla.  
 George Washington Memorial Association, 386 Fourth Ave., New York City  
 National Geographic Society, Sixteenth and M Sts., Washington, D. C.  
 Perry Pictures Company, Box 4, Malden, Mass.  
 Photographic History Service, P.O. Box 2401, Hollywood, Calif.  
 Photographic Section, U.S. Department of Interior, Washington, D.C.  
 Travel Information Bureau, Swedish State Railways, 551 Fifth Ave., New York City  
 Wild Flower Preservation Society, 3740 Oliver St., Washington, D. C.  
 Yosemite Park and Curry Company, Yosemite National Park, Calif.

### *Opaque Projectors*

Bausch & Lomb Optical Company, Rochester, N. Y.  
 Spencer Lens Company, Buffalo, N. Y.

### *Stereographs and Stereoscopes*

Keystone View Company, Meadville, Pa.

### *Standard Glass Slides*

Bailey Art Slide Company, 21 Lake Ave., Newton Center, Mass.  
 Fairchild Aerial Surveys, Inc., 224 East 11th St., Los Angeles, Calif.  
 H. E. Floercky, 543 Muirfield Rd., Los Angeles, Calif.  
 Keystone View Company, Meadville, Pa.  
 Photographic History Service, P.O. Box 2401, Hollywood, Calif.  
 Photographic Section, Department of the Interior, Washington, D. C.  
 Sims Visual Music Company, Quincy, Ill.  
 Society for Visual Education, Inc., 100 East Ohio St., Chicago, Ill.  
 Victor Animatograph Company, Davenport, Iowa

### *Miniature (2" x 2") Glass Slides*

Society for Visual Education, Inc., 100 East Ohio St., Chicago, Ill.

### *Slide-Making Materials*

(Etched glass, colored inks, colored pencils, cellophane, lumarith, slide mats, cover glasses, etc.)

Celluloid Corporation, 290 Ferry St., Newark, N. J.  
 Eastman Kodak Company, Rochester, N. Y.  
 Keystone View Company, Meadville, Pa.

National Theatre Supply Company, 90 Gold St., New York City  
 (Branches in 26 principal cities)  
 Radio Mat Slide Company, Inc., 1819 Broadway, New York City  
 Scarborite Colors, Inc., Scarborough-on-Hudson, N. Y.  
 Society for Visual Education, Inc., 100 East Ohio St., Chicago, Ill.  
 (For 2" x 2" slides.)  
 Victor Animatograph Company, Davenport, Iowa

### ***Standard Glass-Slide Projectors***

Bausch & Lomb Optical Company, Rochester, N. Y.  
 Charles Beseler Company, 131 East 23rd St., New York City  
 Keystone View Company, Meadville, Pa.  
 Spencer Lens Company, Buffalo, N. Y.  
 Victor Animatograph Company, Davenport, Iowa

### ***Miniature (2" x 2") Slide Projectors***

Argus Corporation, Ann Arbor, Mich.  
 Bausch & Lomb Optical Company, Rochester, N. Y.  
 Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.  
 Eastman Kodak Company, Rochester, N. Y.  
 Society for Visual Education, Inc., 100 East Ohio St., Chicago, Ill.  
 Spencer Lens Company, Buffalo, N. Y.

### ***Filmslides***

Eye Gate House, Inc., 330 West 42nd St., New York City  
 General Electric Company, Motion Picture Division, Schenectady, N. Y.  
 Long Filmslide Service, 944 Regal Rd., Berkeley, Calif.  
 Nature Study Illustrated, San Jose State Teachers College, San Jose, Calif.  
 Photographic Section, Department of the Interior, Washington, D. C.  
 Society for Visual Education, Inc., 100 East Ohio St., Chicago, Ill.  
 The Stanley Bowmar Co., 2929 Broadway, New York City  
 U.S. Office of Education, Federal Security Agency, Washington, D. C.  
 United States Department of Agriculture, Washington, D. C.

### ***Filmslide Cameras***

Agfa-Ansco Corporation, Binghamton, N. Y.  
 Argus Corporation, Ann Arbor, Mich.  
 Eastman Kodak Company, Rochester, N. Y.  
 Folmer Graflex Corporation, Rochester, N. Y.  
 E. Leitz, Inc., 730 Fifth Ave., New York City  
 Society for Visual Education, Inc., 100 East Ohio St., Chicago, Ill.

### ***Filmslide Projectors***

Bausch & Lomb Optical Company, Rochester, N. Y.  
 E. Leitz, Inc., 730 Fifth Ave., New York City  
 Society for Visual Education, Inc., 100 E. Ohio St., Chicago, Ill.  
 Spencer Lens Company, Buffalo, N. Y.

### ***Filmslide Attachments***

Bausch & Lomb Optical Company, Rochester, N. Y.

Spencer Lens Company, Buffalo, N. Y.  
Victor Animatograph Company, Davenport, Iowa

### ***Stereo Cameras***

Three Lakes Research Laboratories, Three Lakes, Wis.

### ***Stereo Projectors***

Society for Visual Education, Inc., 100 E. Ohio St., Chicago, Ill.

### ***Microfilms***

Special Libraries Association, 31 East Tenth St., New York City, publishes a "Directory of Microfilm Sources" which lists more than 200 universities, libraries, etc., which have microfilm service available. The Directory also contains complete information concerning the ordering of special microfilms. Price, 75c.

### ***Microfilm Cameras***

Folmer Graflex Corporation, Photorecord Department, Rochester, N. Y.  
Recordak Corporation, 350 Madison Ave., New York City

### ***Microfilm Readers***

Graphic Microfilm Service, 60 Adams St., Waltham, Mass.  
Holbrook Microfilms, Inc., 33 West 60th St., New York City  
Recordak Corporation, 350 Madison Ave., New York City  
Society for Visual Education, Inc., 100 East Ohio St., Chicago, Ill.  
Spencer Lens Company, Buffalo, N. Y.

### ***Film Cabinets***

(Methods of storing inflammable film methodically are provided by modern fireproof film cabinets. They are available in units holding from three to twelve reels, and some are so arranged that on opening the cover the reel is raised and brought within grasp. Each reel occupies an individual compartment, heat-insulated from all others. Arrangements for outside ventilation are also provided. Special cabinets are available for storing 16 mm. and 35 mm. "safety" film.)

American Film-Safe Corporation, 1800 Washington Blvd., Baltimore, Md.  
Chicago Cinema Products Company, 1736 North Springfield Ave., Chicago, Ill.  
National Theatre Supply Company, 92-96 Gold St., New York City  
Neumade Products Corporation, 427 West 42nd St., New York City  
Wenzel Company, 2507 South State St., Chicago, Ill.

### ***Film Cement***

(This adhesive is a special preparation for splicing motion-picture film—indispensable to all who use motion pictures.)

Ampro Corporation, 2839 North Western Ave., Chicago, Ill.  
Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.  
H. A. DeVry, Inc., 1111 W. Armitage Ave., Chicago, Ill.  
Hewes-Gotham Company, 520 West 47th St., New York City  
National Theatre Supply Company, 92-96 Gold St., New York City  
Neumade Products Corporation, 427 West 42nd St., New York City



***Film-Cleaning Machines***

(With these devices, dirt, oil, and grit are removed by running the film between pads saturated with a cleaning fluid.)

Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.  
 National Theatre Supply Company, 92-96 Gold St., New York City  
 Neumade Products Corporation, 427 West 42nd St., New York City

***Lamps—Projection***

(At least one extra lamp should be purchased with a projector. Additional lamps can be secured from the manufacturer of the equipment or from one of the following distributors.)

Ampro Corporation, 2839 North Western Ave., Chicago, Ill.  
 Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.  
 Herman A. DeVry, Inc., 1111 W. Armitage Ave., Chicago, Ill.  
 National Theatre Supply Company, 90 Gold St., New York City  
 Society for Visual Education, Inc., 100 E. Ohio St., Chicago, Ill.  
 Victor Animatograph Company, Davenport, Iowa.

***Lights—Spot and Flood***

(In the production of motion pictures and in presenting pageants, plays, etc., spot and flood lighting is important. The companies listed below will be able to recommend lighting required for any occasion.)

Brenkert Light Projector Company, 7348 St. Aubin Ave., Detroit, Mich.  
 Chicago Cinema Products Company, 1736-1754 N. Springfield Ave., Chicago, Ill.  
 General Electric Company, Schenectady, N. Y.  
 Kleigl Brothers, 321 W. 50th St., New York City  
 National Theatre Supply Company, 92-96 Gold St., New York City  
 Neumade Products Corporation, 427 West 42nd St., New York City  
 Weaver Manufacturing Company, 1639 E. 102nd St., Los Angeles, Calif.

***Tripods and Accessories***

Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.  
 Craig Movie Supply Company, Los Angeles, Calif.  
 Eastman Kodak Company, Rochester, New York  
 Herman A. DeVry, Inc., 1111 W. Armitage Ave., Chicago, Ill.  
 Neumade Products Corporation, 427 West 42nd St., New York City  
 Thalhammer, Ltd., 123 S. Fremont Ave., Los Angeles, Calif.  
 Victor Animatograph Corporation, Davenport, Iowa

***16 mm. Motion-Picture Projectors (Silent)***

Ampro Corporation, 2839 North Western Ave., Chicago, Ill.  
 Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.  
 Herman A. DeVry, Inc., 1111 W. Armitage Ave., Chicago, Ill.  
 Eastman Kodak Company, Rochester, N. Y.  
 Victor Animatograph Company, Davenport, Iowa

***Exposure Meters***

General Electric Company, Schenectady, N. Y.  
 Weston Electrical Instrument Corporation, Newark, N. J.

**Film Titling and Editing Service**

Amateur Cinema League of America, 105 West 40th St., New York City  
 The Calvin Company, B.M.A. Building, Kansas City, Mo.  
 Kodascope Libraries, Inc., 33 West 42nd St., New York City

**16 mm. Motion-Picture Cameras**

Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.  
 Eastman Kodak Company, Rochester, N. Y.  
 Herman A. DeVry, Inc., 1111 W. Armitage Ave., Chicago, Ill.  
 International Projector Corporation, 90 Gold Street, New York City  
 Victor Animatograph Corporation, Davenport, Iowa

**35 mm. Motion-Picture Cameras**

Akeley Camera Company, 175 Varick St., New York City  
 Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.  
 Herman A. DeVry, Inc., 1111 W. Armitage Ave., Chicago, Ill.  
 Mitchell Camera Company, 665 N. Robertson Blvd., West Hollywood, California

**Screens for Projection**

Bausch & Lomb Optical Company, Rochester, N. Y.  
 Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.  
 Da-Lite Screen Company, Inc., 2723 N. Pulaski Rd., Chicago, Ill.  
 Herman A. DeVry, Inc., 1111 W. Armitage Ave., Chicago, Ill.  
 Eastman Kodak Company, Rochester, N. Y.  
 National Theatre Supply Company, 90 Gold St., New York City  
 Raven Screen Corporation, 314 East 35th St., New York City  
 R.C.A. Manufacturing Company, Inc., Educational Department, Camden, N. J.  
 Society for Visual Education, Inc., 100 E. Ohio St., Chicago, Ill.  
 Spencer Lens Company, Buffalo, N. Y.  
 Victor Animatograph Corporation, Davenport, Iowa

**Booths—Projection**

(Get specifications from local and state fire marshal. Booth unnecessary for projection of "safety" prints in most states and cities.)

Anchor Corrugating Construction Company, 130 West 42nd St., New York City  
 E. E. Fulton, 1018 South Wabash Ave., Chicago, Ill.  
 Johns-Manville Company, 292 Madison Ave., New York City

**Film Splicing, Rewinding, and Editing Equipment**

Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.  
 Craig Movie Supply Company, Los Angeles, Calif.  
 Herman A. DeVry, Inc., 1111 W. Armitage Ave., Chicago, Ill.  
 Eastman Kodak Company, Rochester, N. Y.  
 National Theatre Supply Company, 90 Gold St., New York City  
 Neumade Products Corporation, 427 West 42nd St., New York City  
 Victor Animatograph Corporation, Davenport, Iowa

**Screen Paints**

(Paint for resurfacing motion-picture screens is available in flat white and

metallic types. Although no resurfacing material can restore completely the original reflective capacity of a screen, paint of proper mix and pigmentation can effect much improvement if applied with sufficient expertness to insure uniformity of surface. In resurfacing perforated screens, care must be taken to prevent filling of the holes.)

Da-Lite Screen Company, Inc., 2723 N. Pulaski Rd., Chicago, Ill.  
Hewes-Gotham Company, 520 W. 47th St., New York City  
National Theatre Supply Company, 92-96 Gold St., New York City  
Neumade Products Corporation, 427 West 42nd St., New York City  
The Original Re-Nu Screen Surface Company, 5535 Grace St., Chicago, Ill.  
Walker American Corporation, 800 Beaumont St., St. Louis, Mo.

### ***Curtain Control Machines***

(Smooth and silent opening and closing of curtains are effected, either from backstage or from the projection-room controls, by automatic machines that operate at the touch of a button. The curtain may be stopped at any point along the stage, or its motion reversed as desired.

The equipment consists of a motor, a track, and a cable, as well as snaps to which the curtain is fastened. Special models for small auditoriums are available at relatively low cost.)

Acme Stage Equipment Company, 191 Lafayette St., New York City  
Automatic Devices Company, Samuels Building, Allentown, Pa.  
J. H. Channon Corporation, 1447-1455 West Austin Ave., Chicago, Ill.  
Cinema Supplies, Inc., 36-40 Glenwood Ave., Minneapolis, Minn.  
Electric-Air, Inc., 308 Monroe Ave., Grand Rapids, Mich.  
Metropolitan Scenic Studios, Inc., Omaha, Nebr.  
National Theatre Supply Company, 92-96 Gold St., New York City  
Tiffin Scenic Studios, Tiffin, Ohio  
Twin City Scenic Company, 2819 Nicolet Ave., Minneapolis, Minn.  
Vallen, Inc., 225 Bluff St., Akron, Ohio  
Weaver Manufacturing Company, 1639 E. 102nd St., Los Angeles, Calif.

## SOUND EQUIPMENT

### *Acoustical Products*

ACOUSTICAL treatment for the school auditorium and certain classrooms in which sound motion pictures, phonograph records, radio programs, etc., are used is sometimes necessary in order to get the most satisfactory results. Materials most frequently used are sound absorbent tiles, acoustic plaster, rock wool and similar products. Most manufacturers of acoustic materials can supply reliable acoustical recommendations.

Armstrong Cork Company, Lancaster, Pa.

Atlantic Gypsum Company, Boston, Mass.

Atlas Sound Corporation, 1451 39th St., Brooklyn, N. Y.

The Celotex Company, 919 North Michigan Ave., Chicago, Ill.

Garrison Engineering Corporation, 51 Church St., Great Barrington, Mass.

General Insulating & Manufacturing Company, Alexandria, Ind.

Johns-Manville Corporation, 22 East 40th St., New York City

Masonite Corporation, 111 West Washington St., Chicago, Ill.

National Theatre Supply Company, 92-96 Gold St., New York City

United States Gypsum Company, 300 W. Adams St., Chicago, Ill.

Universal Gypsum & Lime Company, 105 W. Washington St., Chicago, Ill.

Western Felt Works, 4029-4133 Ogden Ave., Chicago, Ill.

Wood Conversion Company, First National Bank Bldg., St. Paul, Minn.

### *Microphones*

There are many uses for microphones in schools: to speak through sound motion-picture amplifiers and speakers; for sound recording; with centralized sound systems, etc. Microphones can be used with separate amplifying and loud-speaker equipment, or can be operated through the existing sound installation.

American Microphone Company, Los Angeles, Calif.

Astatic Laboratory, Incorporated, Youngstown, Ohio

Brush Development Company, Cleveland, Ohio

RCA Manufacturing Company, Inc., Educational Department, Camden, N. J.

Shure Brothers, Chicago, Ill.

Western Electric Company, 250 West 57th St., New York City

### *Phonographs*

The increasing importance of recordings of all types requires equipment designed to meet the needs of classroom and auditorium reproduction. The following organizations produce such equipment:

Emerson Radio & Phonograph Corporation, New York City

Farnsworth Radio & Television Company, Fort Wayne, Ind.

Magnavox Company, Inc., Fort Wayne, Ind.

Philco Radio & Television Corporation, Philadelphia, Pa.

RCA Manufacturing Company, Inc., Camden, N. J.



### ***Radio Receivers***

The selection of a radio receiver should be based on the use requirements—classroom, auditorium, or occasional use in each. Portability is usually an important consideration. The following manufacturers produce equipment of various types:

Crosley Radio Corporation, Cincinnati, Ohio

Emerson Radio and Phonograph Corporation, 111 Eighth Ave., New York City

Farnsworth Radio & Television Company, Fort Wayne, Ind.

Galvin Manufacturing Corporation, Chicago, Ill.

Philco Radio and Television Corporation, Philadelphia, Pa.

RCA Manufacturing Company, Inc., Educational Department, Camden, N. J.

Stromberg-Carlson Tel. Manufacturing Company, 100 Carlson Rd., Rochester, N. Y.

Zenith Radio Corporation, 6001 W. Dickens St., Chicago, Ill.

### ***School Radio-Sound Systems***

The following manufacturers have sales engineers available to survey the requirements of specific school buildings, recommend equipment required, and supervise installation.

RCA Manufacturing Company, Inc., Camden, N. J.

Stromberg-Carlson Manufacturing Company, Rochester, N. Y.

Webster-Rowland Company, Chicago, Ill.

### ***Sound Amplifying Equipment***

Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.

Jensen Radio Manufacturing Company, 6601 S. Laramie Ave., Chicago, Ill.

RCA Manufacturing Company, Inc., Camden, N. J.

Universal Microphone Company, Inglewood, Calif.

### ***Sound-Slidefilm Units***

Magnavox Company, Inc., Fort Wayne, Ind.

O. J. McClure Talking Pictures, 1115 W. Washington St., Chicago, Ill.

Operadio Manufacturing Company, St. Charles, Ill.

Radiad Service, 154 E. Erie St., Chicago, Ill.

Society for Visual Education, Inc., 100 E. Ohio St., Chicago, Ill.

Webster Electric Company, Racine, Wisconsin.

## AUDIO-VISUAL PUBLICATIONS

THOSE who are now using or expect to use audio-visual aids to learning will find it desirable to read many of the fine articles appearing regularly in educational magazines of various types. Practically all magazines of importance contain several such articles during each year. These may be located quickly in the Reader's Guide, available in any library.

In addition there are certain publications which any user or prospective user of audio-visual aids will find to be extremely helpful. A few of the most prominent are listed below.

*Business Screen.* Published eight times a year by Business Screen Magazines, Inc., 20 North Wacker Drive, Chicago, Ill. Emphasizes the uses of motion pictures and film slides in industry and in education. Subscription rate, \$2 for eight issues.

*Educational Screen.* Published monthly except July and August by The Educational Screen, Inc., 64 East Lake Street, Chicago, Ill. Official publication of the Department of Visual Instruction, National Education Association, and included in membership dues of \$2 a year. Available to others at \$2 a year or \$3 for two years.

*Film News.* Published monthly by American Film Center, Inc., 45 Rockefeller Plaza, New York City. Brief information concerning new film releases and developments in the documentary and educational film fields. Subscription rate, \$1 a year.

*Group Discussion Guide.* Published monthly, except July and August, by Educational and Recreational Guides, Inc., 1501 Broadway, New York City. The foremost guide to motion picture, theater, radio, and newspaper appreciation, used widely by high-school groups. Principal production reviewed with suggestions to direct discussions. Subscription rate, \$2 a year.

*Visual Review.* Published annually by the Society for Visual Education, Inc., 100 East Ohio Street, Chicago, Ill. An annual review of new developments in audio-visual aids and their uses. Furnished without charge to school executives, classroom teachers, and students in audio-visual courses.

## SCREEN IMAGE TABLES

*For 35 mm. Filmstrips*

The size of the screen image is governed by the equivalent focal length of the lens and the distance the projector is placed from the screen.

The following table applies when **double-frame** film is shown. This table shows the size of picture (in feet and decimals) obtained on the screen with a given focal length lens at a given distance, using horizontal frames. The proportions are merely reversed when showing vertical frames, therefore square screens are recommended.

Equivalent Focal Length of Lens	DISTANCE FROM MACHINE TO SCREEN								
	10'	15'	20'	25'	30'	35'	40'	45'	50'
3"	3.0	4.5	6.0	7.6	9.1	10.5	12.1	13.6	14.9
	4.6	6.8	9.0	11.4	13.6	15.8	18.2	20.4	22.4
4"	2.3	3.4	4.5	5.8	6.8	7.9	9.1	10.2	11.2
	3.4	5.0	6.8	8.8	10.2	11.8	13.6	15.2	16.8
5"	1.8	2.7	3.6	4.6	5.4	6.4	7.3	8.2	9.0
	2.6	4.0	5.4	7.0	8.0	9.6	11.0	12.4	13.6
6"	1.5	2.3	3.0	3.8	4.5	5.3	6.1	6.8	7.5
	2.2	3.4	4.6	5.8	6.8	8.0	9.2	10.2	11.5
7"	1.3	1.9	2.6	3.3	3.9	4.5	5.2	5.8	6.4
	1.9	2.9	3.9	4.9	5.9	6.8	7.8	8.7	9.6

The following screen images are obtained from **single-frame** film at the same distances with given focal length lenses:

3"	2.3	3.4	4.5	5.7	6.8	7.9	9.1	10.2	11.2
	3.0	4.5	6.0	7.6	9.1	10.5	12.1	13.6	14.9
4"	1.7	2.5	3.4	4.4	5.1	5.9	6.8	7.6	8.4
	2.3	3.4	4.5	5.8	6.8	7.9	9.1	10.2	11.2
5"	1.3	2.0	2.7	3.5	4.0	4.8	5.5	6.2	6.8
	1.8	2.7	3.6	4.6	5.4	6.4	7.3	8.2	9.0
6"	1.1	1.7	2.3	2.9	3.4	4.0	4.6	5.1	5.6
	1.5	2.3	3.0	3.8	4.5	5.3	6.1	6.8	7.5

Short focal length lenses should be used when pictures are shown through translucent screens, but such screens are not recommended unless absolutely necessary.

*For 16 mm. Motion Pictures*

Equivalent Focal Length of Lens	DISTANCE FROM MACHINE TO SCREEN														
	8'	10'	12'	16'	20'	25'	32'	36'	40'	50'	64'	75'	100'	125'	150'
16 mm. Projector	WIDTH OF PICTURE														
5/8"	4'10"	6'0"	7'2"	9'7"	12'0"	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3/4"	4'0"	5'0"	6'0"	8'0"	10'0"	12'6"	.....	.....	.....	.....	.....	.....	.....	.....	.....
1"	3'0"	3'9"	4'6"	6'0"	7'6"	9'4"	11'11"	13'5"	14'11"	.....	.....	.....	.....	.....	.....
1 1/2"	2'0"	2'6"	3'0"	4'0"	5'0"	6'3"	8'0"	9'0"	10'0"	12'6"	.....	.....	.....	.....	.....
2"	1'6"	1'10"	2'3"	3'0"	3'9"	4'8"	6'0"	6'9"	7'5"	9'4"	11'11"	14'0"	18'9"	23'5"	28'1"
2 1/2"	1'2"	1'6"	1'9"	2'4"	3'0"	3'9"	4'9"	5'4"	6'0"	7'6"	9'7"	11'3"	15'0"	19'8"	22'5"
3"	.....	1'3"	1'6"	2'0"	2'6"	3'1"	4'0"	4'6"	5'0"	6'3"	8'0"	9'4"	12'6"	15'7"	18'8"
3 1/2"	.....	1'0"	1'3"	1'8"	2'1"	2'8"	3'5"	3'10"	4'3"	5'4"	6'11"	8'0"	10'8"	13'4"	16'0"
4"	.....	.....	1'1"	1'6"	1'10"	2'4"	3'0"	3'3"	3'9"	4'8"	6'0"	7'0"	9'4"	11'8"	14'0"

*For Lantern Slides, 2¾x3-inch Mat Opening*

Equivalent Focal Length of Lens	DISTANCE FROM MACHINE TO SCREEN												
	15'	20'	25'	30'	35'	40'	45'	50'	60'	70'	80'	90'	100'
6"	7½	10	12½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8"	5½	7½	9½	11¼	13	15	.....	.....	.....	.....	.....	.....	.....
10"	4½	6	7½	9	10½	12	13½	.....	.....	.....	.....	.....	.....
12"	.....	5	6¼	7½	8¾	10	11¼	12½	15	.....	.....	.....	.....
15"	.....	4	5	6	7	8	9	10	12	14	16½	.....	.....
18"	.....	.....	.....	5	5¾	6½	7½	8¼	10	11½	13	15	16½
20"	.....	.....	.....	4¼	5	5¾	6½	7¼	8¾	10¼	11¾	13¼	14¾
22"	.....	.....	.....	.....	.....	5¼	5¾	6½	8	9¼	10½	12	13¼
24"	.....	.....	.....	.....	.....	4¾	5¼	6	7¼	8½	9¾	11	12¼

Example: A 10-inch lens used at a distance of 40 feet from the screen will project an image measuring 12 feet on its longer side.



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